WEEDS TREES and TURF

JUNE 1974

SPECIAL SECTIONS: AQUATIC WEED CONTROL, SOD

Dawn Attack . . . on Hydrilla

What You Should Know About Surety Bonds

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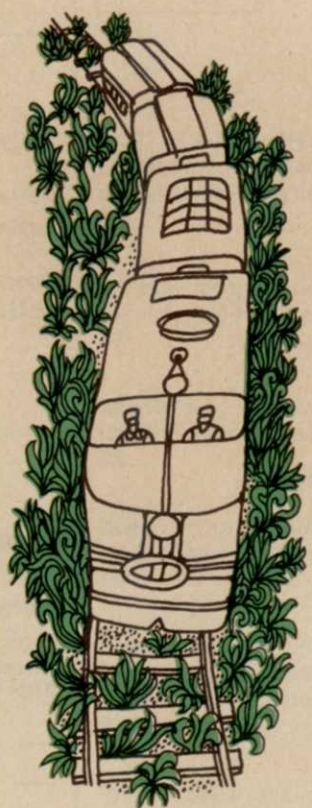
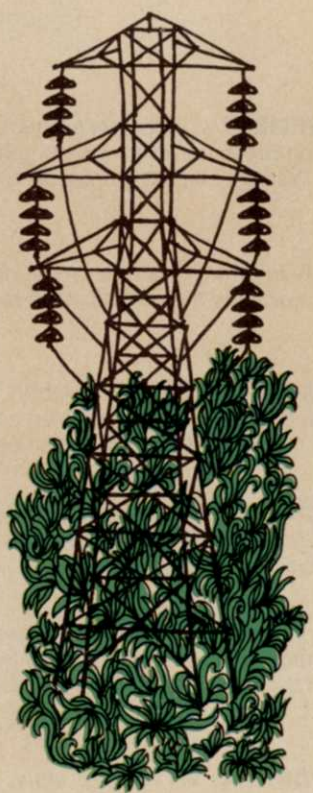


FOR RAILROADS



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WEEDS TREES and TURF®

June 1974, Vol. 13, No. 6

THE COVER—It's early morning in Florida. And Harold Brown of Southeastern Helicopter Service, Fort Pierce, prepares to attack hydrilla by taking on premixed chemical from a nurse truck.

MORE PLAY, BETTER MANAGEMENT at Baltimore's Sparrows Point Country Club. With gas supplies down and golfing pressure up a modern golf course superintendent cannot afford turf disorders. Alex Watson, club superintendent, is an excellent example of the efficient manager **14**

BONDS and BONDING: A highly informative article on the not-so-complex world of surety bonds. John J. Curtin, Jr., explains the ground rules in this fascinating field of finance **16**

ARE YOUR TREES STARVING TO DEATH?—Dr. Harold Davidson, of Michigan State's Department of Horticulture, describes several problems turf men encounter with trees. His report also includes a review of the latest remedies **20**

HERBICIDES FOR COMMERCIAL SOD: How do they influence the crop? Weed control is a constant problem for sod growers and herbicides a must. A recent study reveals interesting effects of herbicides on sod rooting **22**

NEMATODE CONTROL: Wise Insurance — Year-round play on a municipal golf course in Florida doesn't leave much time for nematode control. What is the answer? John Weseloh explores the role of the custom applicator in golf course nematode control **29**

DAWN ATTACK . . . ON HYDRILLA: WTT cover story. Aquatic weed control specialists continue the battle against one of Florida's waterways most prolific stranglers **38**

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editorial

FORMER Agriculture Secretary Benson used to say that water, land and people are inseparable components of one thing . . . *our welfare.*

Isn't this about the strongest environmental impact statement ever made? And it was delivered a decade or two before "environmental impact" was even coined as a phrase.

In our industry, the elements of water, land and people are parts of an aggregate and we must deal with the relationship as a single entity. Water resources are an excellent example.

This month WEEDS TREES and TURF deals with aspects of aquatic weed control in a special section. And next month there will be heavy emphasis on irrigation.

Irrigation, in our view, is more of a people business than water business. So is aquatic weed control.

People have been responsible for the spread of the aquatic weed industry up through most of the country. And we're not talking about a youngster tossing hydrilla seeds from a car window all the way to Iowa. We're talking about an explosion in the appreciation of water as a factor of beauty — about climbing real estate values where ponds, lakes and streams are concerned. About the ever-rising demands for recreational water.

We're talking about the critical concern for the protection of potable water supplies all across the country. Legislators and federal attorneys are looking right through microscopes at these concerns Water quality . . . water beauty! These are terms for the 1970's and 80's. They are *people concepts.*

We agree with the ideas of former Hyacinth Control Society president Robert Gates . . . that environmental improvement is, in effect, good housekeeping. His chief concern two years ago is still ours today; that people must be willing to pay if they would solve environmental problems and preserve a way of life for their children and grandchildren.

For these reasons we see members of the vegetation care industry as stewards in the protection of America's resources . . . proprietors of the knowledge and techniques to preserve life and beauty . . . managers in an industry which provides for *the welfare of people.*

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MORE THAN 50 YEARS OF EXPERTISE—TORO's learned a lot about total turf care in 50 years. And all that experience is available to you whenever you need it through our distributor network.

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OSHA and the Tree Man

By Robert Felix, Executive Secretary
National Arborist Association, Inc.

guest editorial

When President Nixon signed the Occupational Safety and Health Act in 1970 no one had any idea what it's impact would really be. The Tree Care Industry was as poorly prepared as anyone else. Three years have passed since OSHA became law (April 28, 1971) and I wonder how many tree companies are complying with the law today.

From the time your office door opens in the morning until the lock snaps at night, your personnel, your equipment and your techniques come under the scrutiny of OSHA. In my brief tenure as executive secretary of the National Arborist Association I have had occasion to visit the offices and shops of many tree companies. In some instances the degree of compliance has been substantial, in others feeble.

We are not currently a target industry, but don't let that lead you to believe that you will not be visited by the man from OSHA. A number of tree companies have been visited resulting in citations in some instance in excess of $2500.00. Don't be a victim of your own disinterest.

Keep in mind that OSHA was intended to provide a safe place to work for every American in private enterprise. By complying with the law and preparing in advance for the OSHA visit that may or may not come, you are improving your own position from a safety standpoint. In the long run you will save money.

Your cost of insurance will decrease as employee safety increases. Granted, initially you will incur some expenses in acquiring the necessary safety devices. But over a long term you will recover this in reduced cost of Workmans Compensation Insurance, reduced lost time due to injuries and increased efficiency. It is not as bad as it seems and if you do it right it is almost painless.

How does a tree company comply with OSHA? There are numerous publications that interpret the law. Some insurance companies can offer guidance. The American National Standards Institute Z133 Standard has not yet been adopted by OSHA but provides most of the operational safety information. The National Institute of Occupational Safety and Health (NIOSH) in Washington, D.C. can help and if your plant requires considerable rehabilitation to comply. The Small Business Administration is prepared to help with low interest loans.

The National Arborist Association has distributed to it s membership an "OSHA Manual" which interprets the law as it applies to the tree care industry. This manual is available to members only and is divided into several categories including management responsibility, plant safety, employee safety, equipment safety, material safety and operational safety.

As new regulations are made by the Occupational Safety and Health Administration they are interpreted and sent to NAA members for insertion in their NAA OSHA Manual.

OSHA might seem like a monster but if properly accepted and applied it will be a tremendous benefit to the employer. It was not designed as a penal code. You can live with it and make a profit from it if you handle it properly. □

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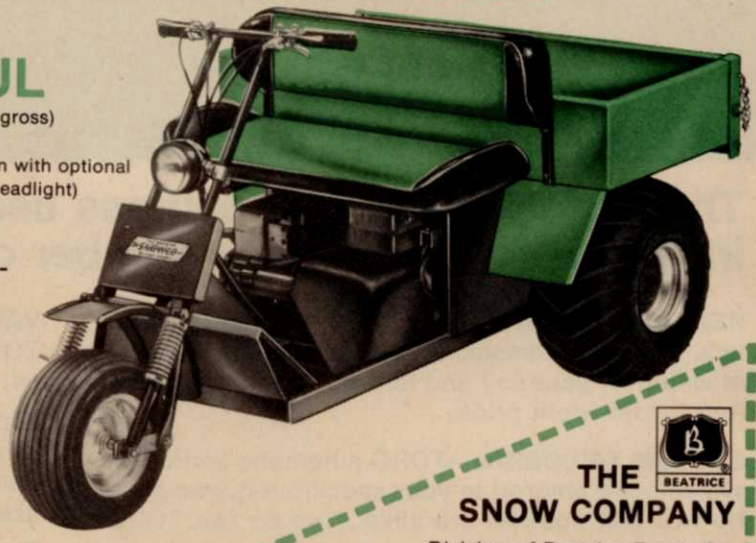
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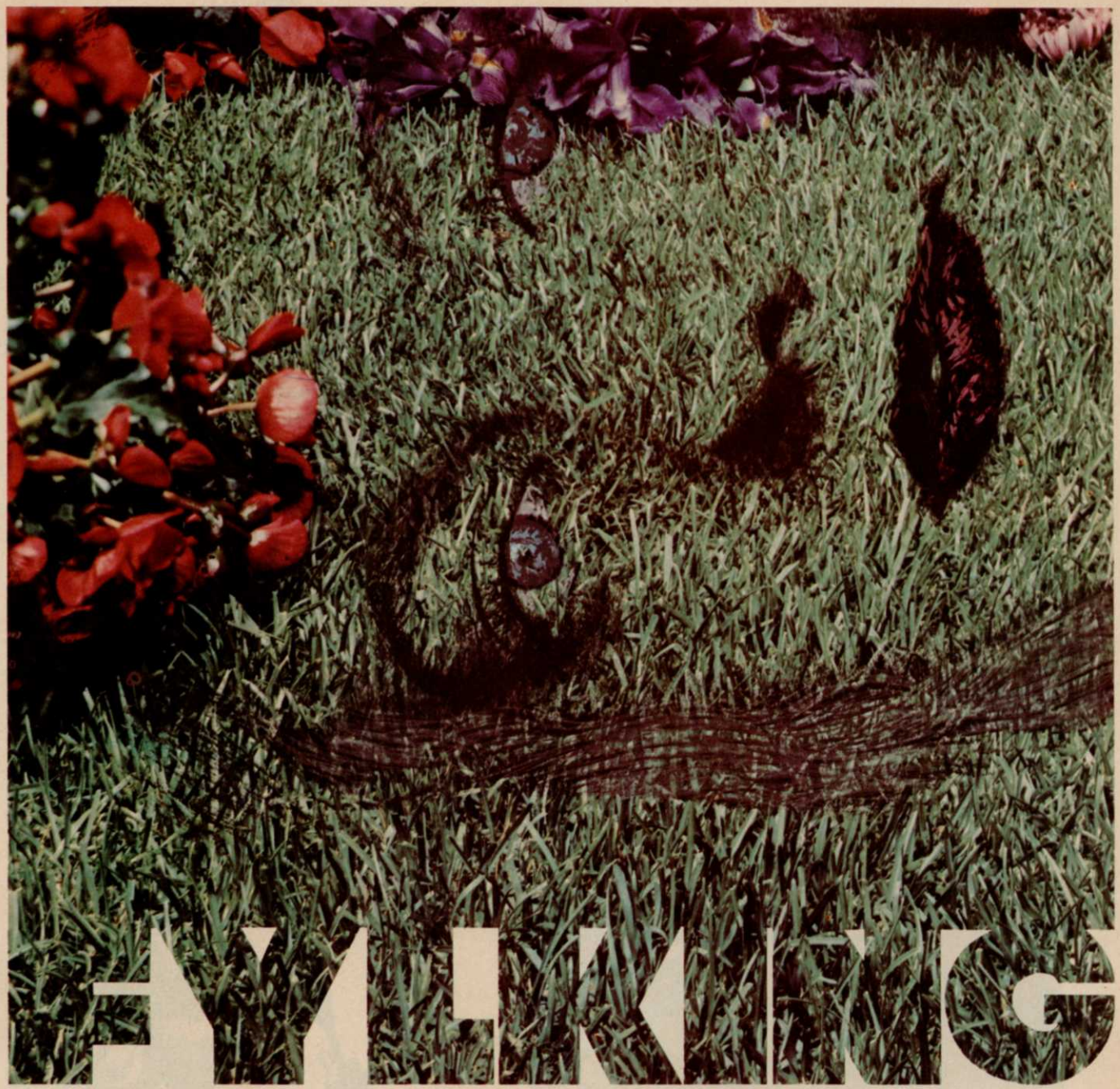

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Government News / Business

EPA is proposing new federal standards to protect agricultural workers from pesticides, in addition to safety precautions now required on container labels. The proposed standards include: barring all persons but applicators from a field being treated; barring entry to the field for 12 hours after treatment unless the worker is wearing protective clothing (48 hours in the case of 13 listed pesticides); and various restrictions on preharvest operations in a treated field.

A U. S. Forest Service plan to defoliate some 2½-square miles of national forest lands in Wisconsin has encountered strong opposition from local environmental groups. The Forest Service plans to spray 32 areas with 2,4-D and 2,4,5-T to kill scrub oak and other broadleaf trees that are depriving red pines of light they need to grow. Forest officials say there is legitimate concern over effects of the chemicals, but applicators will be following standards even more strict than those set by EPA. The pesticides have been used more than 20 years as vegetation control for highways, railroads and industrial applications.

The Federal Energy Office has issued new rules on industry exclusions from petroleum allocation. Regulations apply primarily to fuel oil consumers but could be applied to other petroleum products should another shortage situation arise. Ornamental shrub and tree services is the only category excluded from the regulations under the new listing. This classification is defined as: "Establishments primarily engaged in performing a variety of ornamental shrub and tree services." It includes arborists services, ornamental bush and tree planting, pruning, bracing, spraying, surgery, tree trimming for public utility lines and utility line tree trimming services.

EPA's Office of Pesticides has retained CONSAD Research Corporation, Pittsburgh, Pa., to study and determine the extent of urban pesticides runoff. CONSAD plans to describe the use and time of use of pesticides in urban areas and the extent of runoff; evaluate the direct and indirect impact on the environment resulting from urban pesticides runoff with emphasis on the pathways to the aquatic environment; and recommend systems which will control the subsequent loss of properly applied pesticides.

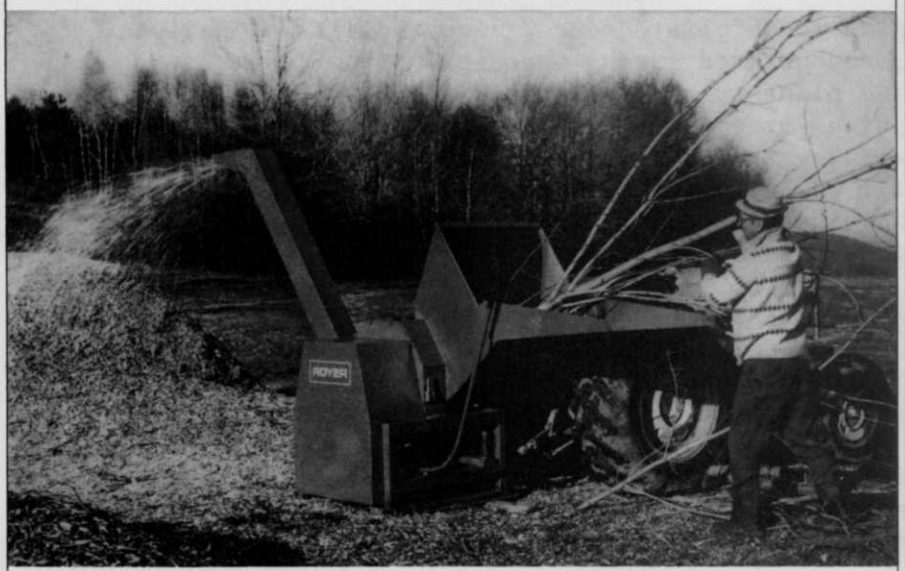
OSHA boss, John H. Stender, citing U. S. Public Health Service statistics, said the death rate from occupational diseases--100,000 per year--is seven times higher than the rate of on-the-job accidents. He said OSHA and its research arm, the National Institute for Occupational Safety and Health (NIOSH) of the Department of Health, Education and Welfare, have started a $3.5 million crash program to develop complete standards for 400 of the most toxic substances. U. S. Department of Labor also says it will assist states operating federally-approved job safety and health programs in investigating catastrophic and other unusual accidents.

Regulations to administer experimental use permits have been proposed by EPA for unregistered pesticides or pesticides with restricted registration. The regulations are designed to allow limited use of a pesticide which may provide substantial pest control benefits, while generating data on the pesticide's effects on the environment.

The Royer Chipper.

You won't scream at the cost.

The chipper won't scream at you.



PTO three-point-hitch model 2600

...thanks to a new design concept

Royer's new "2600" Series Chippers are designed to be a lot easier on your budget and your ears. They provide an exceptionally fast, low-cost way to convert brush, branches, trimmings and stalks into chips. And, they're specifically designed to meet the needs of small commercial applications . . . are available in both PTO (three-point-hitch for tractor operation) and self-powered models.

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We believe you'll like everything about our new chippers. Their performance. Their lower cost. Their quieter sound. You can get complete details by requesting "2600" literature.

ROYER

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**Patent pending*

letters

Dear Sir:

As always, I read with interest and pleasure the many fine articles appearing in the March issue of WEEDS TREES AND TURF (Volume 13, No. 3, 1974). A small article on page 64 relative to sycamore anthracnose, however, may be somewhat misleading. The title of the article suggests wet weather favors this particular disease; some of the best research into weather influences on sycamore anthracnose was done by Dan Neely and Gene Himelick in the early 1960's and reported in Plant Disease Reporter Volume 47:171-173. They found that wet conditions had very little if any effect on disease severity and spread, and that the governing factor was principally cool air temperatures during the two weeks preceeding bud break. This was a fine bit of applied research that gave us the optimum time for applying fungicidal control.

Again, many thanks for your fine magazine.

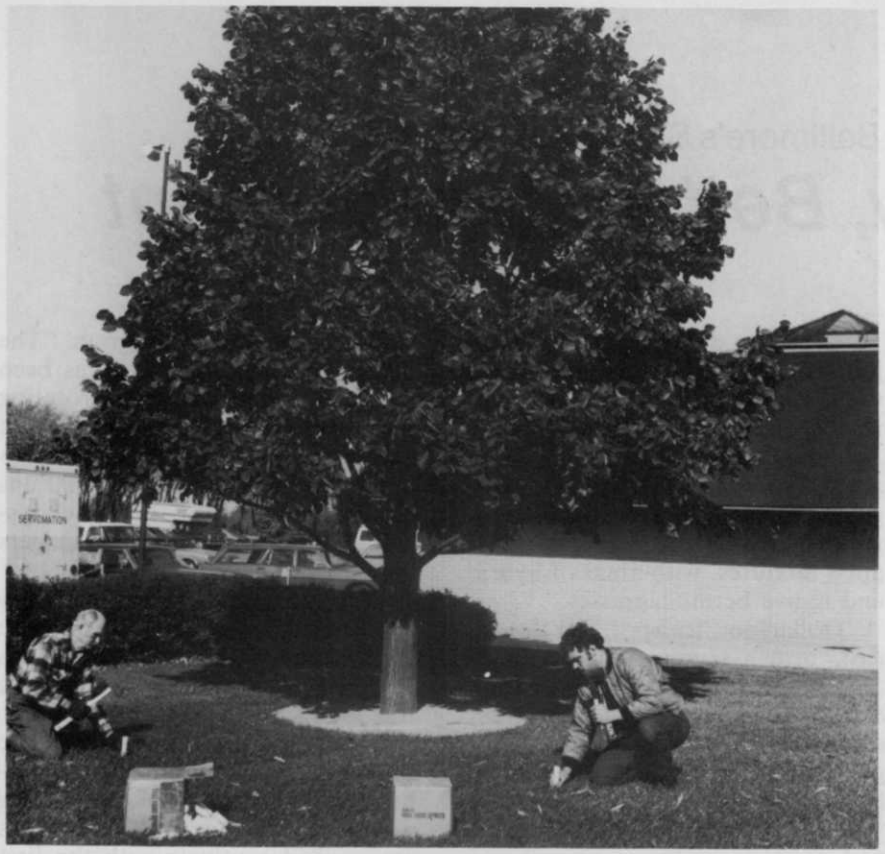
David S. Wysong
Extension Plant Pathologist
Cooperative Extension Service
University of Nebraska
Lincoln, Nebraska

Dear Sir:

I have to take issue with a comment in your March 1974 issue. On page 14 under Government News/Business, the first story relates to OSHA. In line 4 and 5 it states that "Most farm machinery is adequately guarded, anyway".

This is far from true. I work with farm safety in Nebraska. Many of our manufacturers are sincere and do a good job of shielding, however, we have many companies who do no shielding at all. To date, (March 21) in 1974, we have killed 5 Nebraskans with unshielded farm equipment. Two of these were elevators, 1 grinder, 1 post hole digger, and 1 hay loader. I don't consider the loss of 5 lives the price we must pay for poor shielding. If we had proper shielding of equipment, the standards would not be needed.

Rollin D. Schnieder
Extension Safety Specialist
Cooperative Extension Service
University of Nebraska
Lincoln, Nebraska



"Jobe's TREE FOOD SPIKES save time, labor and money."

says Delos A. Bailey, owner of Del-Mar Landscaping Service, Bloomington, Minn.

George Mann, left, and Chris Danielson, Del-Mar Landscaping Service, Bloomington, Minn., fertilize their customers' trees with Jobe's Tree Food Spikes.

"Good help is hard to get. Up here in Minneapolis we're busy both summer and winter—with snow removal a big job in the winter. Mowing, tree and shrub planting, trimming and fertilizing keep us busy in the summer. That's why we like Jobe's Tree Food Spikes for fertilizing trees. The analysis is right —*and they sure save time.* Jobe's are simple to use: just one spike per inch of trunk diameter."

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5 minutes labor @ $4/hr.	.33
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Call your nearby supplier or order direct—5 cases @ $25 per case*, 20 cases at $22 per case, freight prepaid.

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Baltimore's Sparrows Point

More Play, Better Management

ALMOST IN THE MIDST of Baltimore's outlying industrial area lies Bethlehem Steel's Sparrows Point Country Club. In contrast to the beehive of activity in the nearby business community, the peaceful, country atmosphere of the club makes it stand out almost like an oasis in a desert.

The club provides a convenient recreational and social outlet for the corporation's employee-members and their guests. Maintaining that relaxing atmosphere provides a special challenge for golf course superintendent Alex Watson.

The Sparrows Point membership includes upwards of 700 golfers who utilize the club's nine and eighteen hole courses.

"The golfing pressure is increasing," Watson observes. "The number of members hasn't increased that much, but we are getting more and more play by the members and their guests. This means that the grounds maintenance crew has to accomplish more in a day to avoid interfering with play."

This increasing player pressure is directly related to one of Watson's current major problems, finding good labor. "We're located right in the heart of a major industrial area," he explains. "People don't care to work here when they can find higher paying jobs in a factory just down the road. College students are a big help to us during the summer months. They're inexperienced, of course, but they're good workers, and we'd be hard-pressed without them."

Increasing golfer pressure combined with a limited seasonal labor supply puts a premium on organization and management. A valuable aid, Watson has learned, is a well-planned, closely-followed work schedule. His master schedule coordinates activities all year long, as well as in the busy months of May through August when his crew usually numbers 18 or 19 men.

Of all the duties that go with his job, turfgrass management, naturally, is a top priority item. At Sparrows Point, the greens are mainly Arlington and Congressional bentgrass. Tees are mostly bermudagrass, with some bluegrass and bentgrass. Fairways are primarily bluegrass mixtures, with areas of hybrid and native bermudagrasses.

Dollarspot, leafspot, red thread, rust, brown patch, and, occasionally, snow mold are the common disease threats in Watson's area. But a four-season preventive spray program has minimized disease problems, he says.

"Each spring, as soon as weather and ground conditions permit, we treat tees and fairways with fungicides, herbicides, and insecticides," he explains. "The greens are treated with fungicides and insecticides only, and the treatment is continued regularly throughout the season."

A combination of systemic and contact fungicides is the key to Watson's disease control program. "The development of systemics has been helpful," he notes. "And rotating them with a basic contact product like Acti-dione has enabled us to avoid the problems of disease strains resistant to some of the newer systemics that many turf managers have encountered."

For greens, Watson combines regularly scheduled fungicide applications with daily inspections for disease. Additional fungicide treatments are applied if needed.

Once begun, fairway and tee fungicide treatments are also continued through the end of the playing season. Herbicides and insecticides are applied routinely with the first two fungicide applications, then discontinued unless required.

Watson's crew saves time and labor by making combined herbicide and fungicide applications when the products permit. "We always check compatibility of products before mixing them together,"

A radio-equipped golf cart provides mobility while keeping Watson in touch with members of his maintenance crew.

he notes. "Compatibility charts provided by some of the manufacturers are a big help." Wetting agents are also added to fungicides when the label permits.

Off-season treatments are dictated by the weather. If possible, Watson likes to make a late November or December fungicide application to prevent snow mold on greens. "If conditions permit, we like to make one greens application prior to February," he says. "Even if the weather's bad, though, we always make a late February application."

During the golfing season, Watson's schedule calls for treating greens on Friday to prevent disease outbreaks during the busy weekends. Even though his crew works a half day on Saturdays, and a skeleton crew remains on duty on Sundays, weekend golfer traffic precludes spraying. Fairway treatments are scheduled so as to begin on Monday and finish before Friday.

Fertilizer and herbicides are also accounted for in Watson's master schedule. A 2,4-D MCPP, dicamba mixture is applied with the first two fungicide treatments to control knotweed and troublesome broadleaf weeds. Later applications are made as needed.

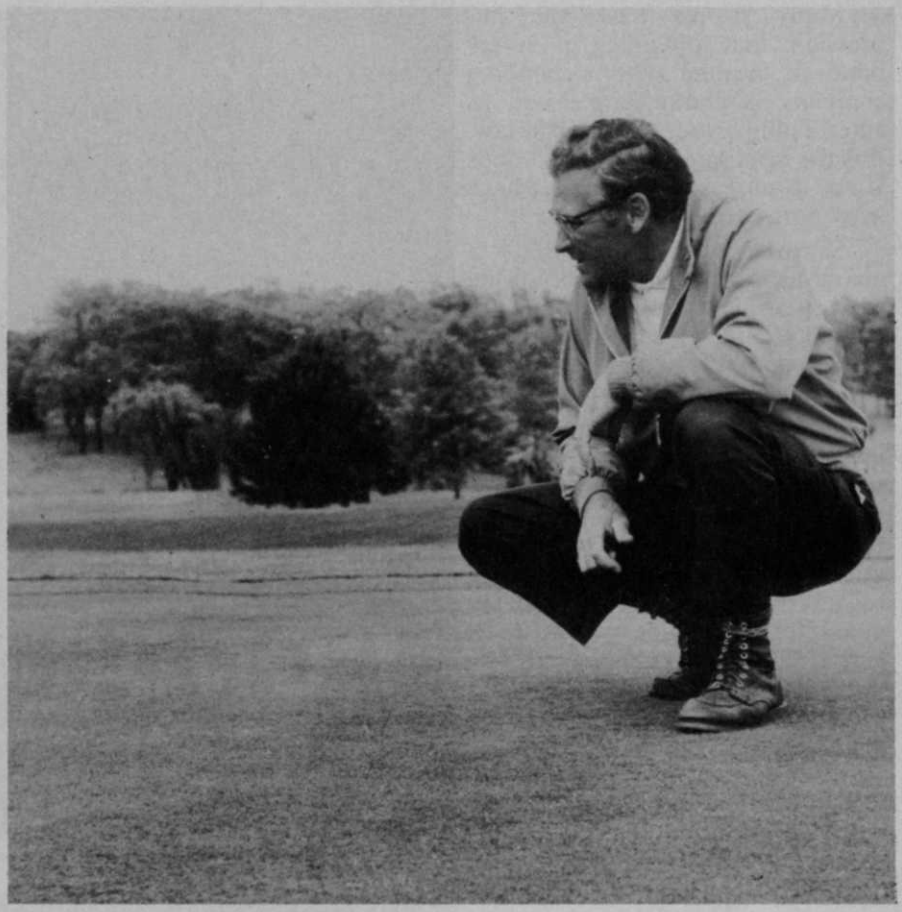
Fairways and tees are fertilized every four weeks throughout the playing season, receiving a total of seven or eight pounds of nitrogen per 1,000 square feet during the course of seven or eight applications. Bermuda tees receive from two to four pounds more nitrogen than bluegrass, a yearly average of about ten pounds per 1,000 square feet.

Greens receive the same total amount of nitrogen, but with smaller, more frequent applications — normally about 13 treatments continued through the winter season.

"We take soil tests from tees, fairways, and greens every three or four years to determine exactly how much fertilizer to apply," Watson notes. "These tests also tell us whether lime is required."

Watson has found that grass doesn't require as much phosphorous as was commonly supposed in the past. Consequently, this year's application is a mixture of nitrogen and potassium.

"Those of us who have been on a tricalcium arsenate program for Poa annua control have found that phosphorous tends to negate the effects of the weed killer," he adds, "particularly in poorly drained areas."



Regular fungicide applications plus frequent spot checks help Watson avoid disease problems.

Watson has been testing tricalcium arsenate for several years, with good results. "The only Poa *annua* left is in poorly drained areas where we believe phosphorous is tying up the tricalcium arsenate in the soil.

"We have applied about 26 to 28 pounds of actual tricalcium arsenate per 1,000 square feet over the entire course," he continues. "This is considered the peak amount required for maximum Poa and crabgrass control. From now on, we'll add about three pounds per season to maintain this level."

The more flexible items on Watson's master plan — drainage and irrigation, for example — are handled as time and labor permit.

"We normally water the fairways between 5 p.m. and 10 p.m. every evening when dry weather persists. The greens are watered as necessary," he says. "The shrubbery, trees, and flower beds we take care of when we can."

Aerification of greens, tees, and fairways is done in the fall and any other time it's needed. Watson does not believe in spring aerification as a standard practice.

"I prefer to avoid operations that set back the grass in the spring," he explains. If necessary he'll slice or spike the turf during the summer, but he prefers to have the turf fairly dense as spring approaches.

"In the fall, when the grass has been through a hot, humid semi-dormant period, is the time you can help renew and invigorate it with aerification, fertilizer, and overseeding if necessary," he believes.

Planning work in advance and utilizing new developments and information enable Watson and his crew to keep Sparrows Point attractive and functional for its membership. "We work closely with the University of Maryland, Penn State, and VPI to keep abreast of their research," he says, "and industry helps, too. Some companies have obviously put a lot of time and research into developing products and information that turf management people can benefit from."

BONDS AND BONDING

By JOHN J. CURTIN, JR.*

Inside Report From A Surety Specialist

Many people have the impression that obtaining a surety bond or dealing with a bonding company is about as pleasant as entertaining your mother-in-law. But the mystique attached to bonds is not as unreasonable as they have been portrayed.

Simply put, a bond is a guarantee of the performance of an obligation. In it, one party guarantees to a second party the performance of an undertaking or obligation by a third party.

Historically, guarantees were given by individuals until the 1870s when corporations began issuing such guarantees for a fee. The entrance into this field by corporations was a logical step since going to a friend and asking him to guarantee something obviously is embarrasing, particularly if he refuses. In addition there was always the question of the adequacy of the guarantor.

Today, bonds are required by federal, state, county and municipal governments to protect taxpayers dollars particularly in the area of the construction of government financed projects. The cost of these projects represents an expenditure of billions of dollars every year. To spend this money without guarantees that those receiving it will perform would border on the criminal. Owners in the area of the private sector of construction require bonds to protect their investment in their projects. Finally, subcontractors and suppliers rely on labor and material payment bonds as a guarantee that they will be paid for work they do and goods they supply.

A surety bond is a written instrument by which two parties, namely the principal and the surety, become obligated to a third party, the obligee, for the payment of a sum of money, not to exceed the bond amount, if the obligation set forth in the bond is not fulfilled. It is a contract resting on an underlying contract or obligation.

This is not insurance. Many people tend to equate surety and insurance as being the same thing because insurance companies are the major writers of surety bonds. This is due to the fact that insurance companies have the financial strength to put at risk. By virtue of their financial strength and their having been in the business of extending surety guarantees, insurance companies are the only corporate entities with the staff and the expertise to properly evaluate a surety situation.

There are several major distinctions between surety and insurance. Basically, they are in the area of definition and approach. A surety bond is an extension of credit. It is a financial institution pledging its assets on behalf of someone else who does not possess those assets. While surety bonds are a pledging of assets they are undertaken with the idea that the pledge will not have to be honored because they have evaluated the obligation and are confident that it will be completed properly. On the other hand, insurance contracts presuppose loss. An insurance company knows that out of every dollar it takes in in premium a certain percentage of that dollar will be paid out in losses.

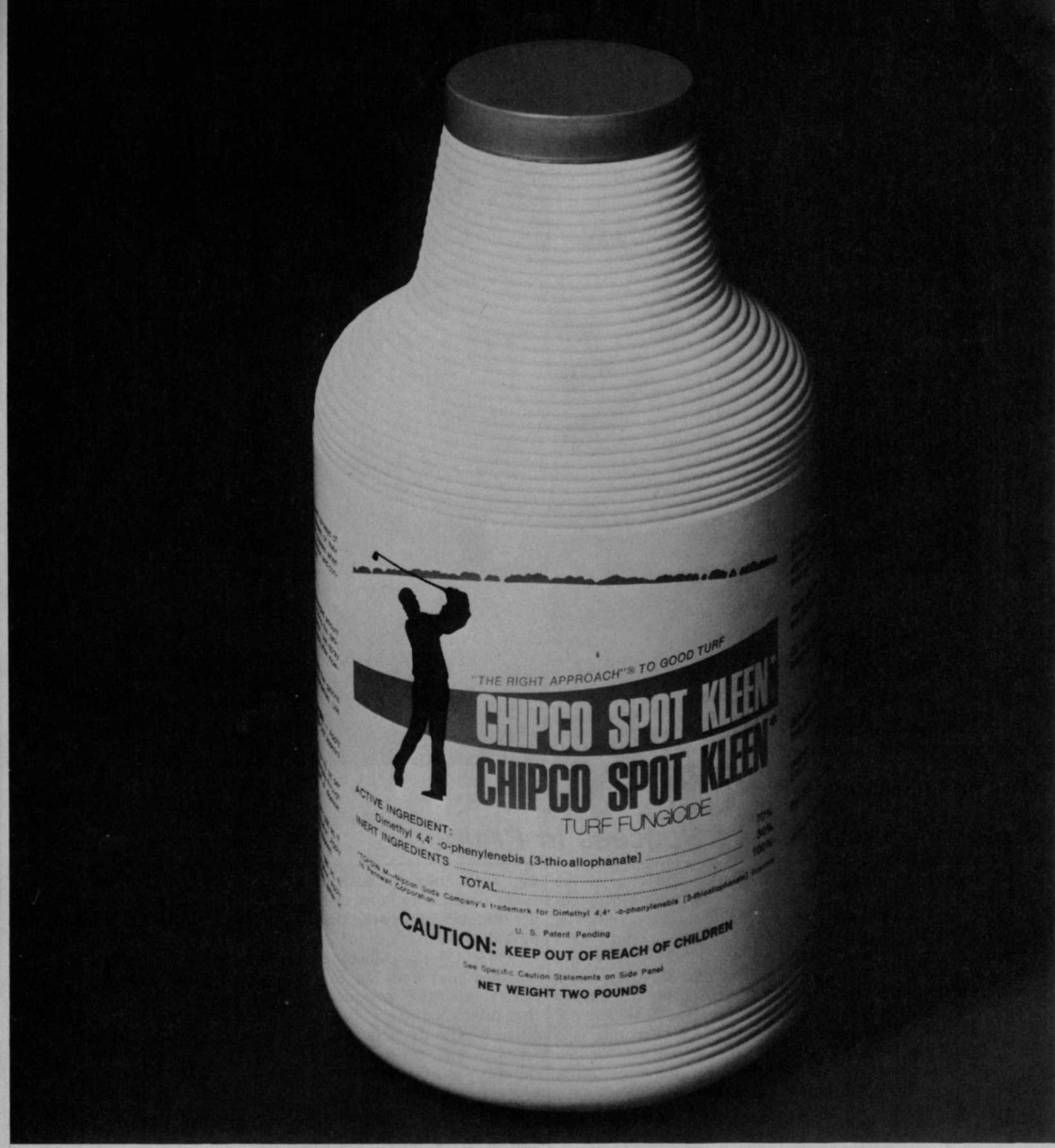
How is a bond obtained? The first step is to talk to a surety agent. He should do the initial investigation and make the submission to a company which best fits the situation. This is important because companies, while they all adhere to the same basic set of principles, vary in their interpretation of those principles and in their personnel. A good agent will generally be aware of which companies fit your situation best and will go directly to those companies.

A surety is going to analyze each case differently and make its decision on the facts presented but the basis of the decision will be the people involved more than any other single factor.

Basically, from the point of view of the information desired by a surety all we have to do to anticipate their questions is to remember what they are doing. In most cases a surety is being asked to guarantee the performance of a contractual obligation and the payment of bills incurred in the course of that contract. Therefore, it is logical for a surety to look at your ability to perform and to pay. Superimposed on these two areas is a determination that the seeker of surety credit possesses integrity.

(Continued on page 56)

* The author is a member of the surety staff of the Francis H. Curtin Insurance Agency, Inc., Cambridge, Mass. He is also regional vice president of the National Association of Surety Bond Producers and treasurer of the Surety Underwriters Association of Mass.



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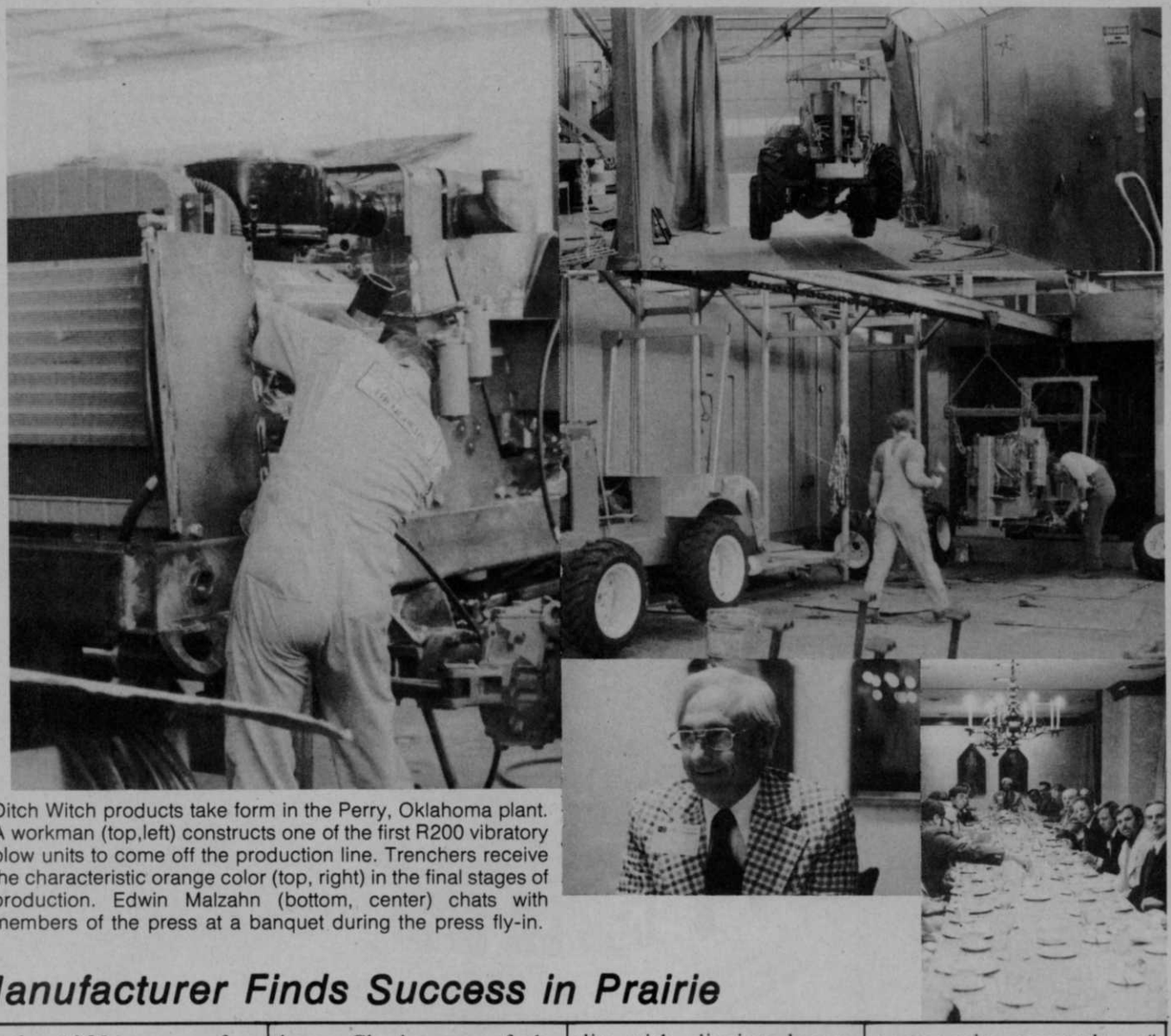

Ditch Witch products take form in the Perry, Oklahoma plant. A workman (top,left) constructs one of the first R200 vibratory plow units to come off the production line. Trenchers receive the characteristic orange color (top, right) in the final stages of production. Edwin Malzahn (bottom, center) chats with members of the press at a banquet during the press fly-in.

Manufacturer Finds Success in Prairie

In 1955 a manufacturing company set in the middle of Oklahoma prairie country had nine employees and a goal. Today, that same company employs nearly 600 persons, is growing rapidly and sells many of its products before they leave the production line.

The company is Charles Machine Works, owners of Ditch Witch, and its product is trenching equipment. Not standard trenching equipment, but smaller, more mobile trenching equipment. In fact, Charles pioneered the service-line trencher.

A constant stream of innovations, a unique sales representative arrangement, and a family spirit keeps Charles one of the forerunners in the trenching manufacturing business. Its latest innovation is a 195-h.p. vibratory plow unit designed to lay utility cable up to 3-inches in diameter at rates up to 7,000 feet per hour. The new product, the R200, has appeal for the telephone and large utility industries. Prototypes built to test the design have installed more than one million feet of cable in various types of terrain. The first production unit will shortly leave the production line.

Another recent innovation is the multiple-use modular trenching unit. A single unit can trench, lay cable with vibratory plow, replace dirt with backhoe, dig with digging boom, carry a reel, bore holes under obstacles and sweep the pavement with a broom.

Once Charles Machine designed and built an industry adapted product, they proceeded to set up an efficient sales network. The country was divided into regions and sales managers, rather than living in their region, live near the plant in Perry, Oklahoma and fly to their regions to sell. Consequently, sales families remain in Perry as part of a larger, company family.

The Ditch Witch family consists of everyone working for Charles Machine Works. Unity of spirit is evident. A profit sharing program spreads the economic rewards of success to each employee. Consequently, motivation is at its highest. A group effort production line further strengthens ties between employees.

The man behind it all is a third generation Perry native, who after obtaining a degree in engineering, took his father's metal shop where oil drilling equipment was made, and the pioneer spirit of his grandfather, a Perry blacksmith, and made it into success for the entire community. Edwin Malzahn's plant today employs a tenth of the population of Perry and has turned an agricultural town in the middle of the Oklahoma prairie into a booming industrial center.

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Are Your Trees Starving to Death?

By HAROLD DAVIDSON
Department of Horticulture
Michigan State University

Iron chlorosis in oaks is associated with alkaline soils containing relatively high concentrations of phosphates and bicarbonate ions.

These maple leaves exhibit signs of chlorosis. The probable cause is a manganese deficiency.

Most chlorosis can be corrected by using Fe or Mn chelates or by inserting iron-containing capsules into the trunks of the trees.

IN MOST CASES, the chances are your trees are not starving to death. But rather they are enjoying a more than adequate diet of N, P and K, since turf people are known to be fairly liberal in applying fertilizer to turf. And where turf is well fertilized, the trees in those areas are also well fertilized.

However, there are a couple of situations where the trees could be starving to death in areas of plenty. This would be where you are irrigating the turf with water of high pH, in the range of 7.5 to 8.5, and where there are tree species — oak, sugar maple, sycamore — that do not like the alkaline environment. In this situation, the trees develop chlorosis; that is, the leaves fail to develop the green color in the area between the veins, although the area adjacent to the veins remains green. The chances are fairly good that the trees are suffering from iron or manganese chlorosis. It is difficult to determine the difference between the two deficiencies without chemical testing. The probability is fairly good that on oaks, especially pin oak, that the problem is related to iron and on maple it could be Mn.

Iron chlorosis is aggravated by factors that promote the oxidation of iron from the ferrous (Fe^2) to the ferric (Fe^3) form. It is associated with alkaline soils containing relatively high concentrations of phosphates and bicarbonate ions. Also, decomposing organic matter in alkaline soil will help to increase the alkalinity of the soil and thus maintain iron in the ferric form.

Plants that cannot counteract the alkaline soil factors will develop iron chlorosis. The fate of the plant is related to its ability to change iron from Fe^2 to Fe^3.

Many remedies have been recommended to correct iron chlorosis. They include: 1) the pounding of iron nails into the trunk, 2) injecting iron salts, such as ferric citrate, iron tactrate and iron sulfate into the trunk, 3) spraying the leaves with various solutions containing iron, 4) application of iron salts to the root zone, 5) the use of iron chelates both as sprays and soil injection, and 6) modifying the soil pH by using various acidifying agents,

(Continued on page 54)

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Sod plugs, cut from field test plots, are transplanted to pots filled with sand to determine root production.

Herbicides for Commercial Sod: How Do They Influence the Crop

By JOHN A. JAGSCHITZ and C. R. SKOGLEY[1]

WEED CONTROL chemicals are a must for successful commercial sod production. No matter how good the quality of grass seed that is sown or how refined the establishment and maintenance program, nature will assure a generous supply of weeds. These weeds will most likely be both broad-leaved and grassy types. Fortunately, there are weed control chemicals available that may enable the production of weed-free, quality turf. These chemicals have been around for some time and have been used extensively for turf purposes. Chemicals used in commercial sod production, however, must not delay the development of the crop or interfere with harvesting or successful establishment after harvest.

Studies were initiated at the Rhode Island Agricultural Experiment Station, starting in 1970, to evaluate effects of both crabgrass and broad-leaved herbicides when used in sod production. The goal was to determine whether these herbicides were safe when applied at various stages in the development of sod.

Standard rates of granular preemergence crabgrass herbicides including benefin (Balan), bensulide (Betasan), DCPA (Dacthal) and siduron (Tupersan) were applied in the spring to Kentucky bluegrass sod that was seeded in the fall and still developing (immature) and to mature stands ready for harvest. The rate of sod development was measured visually by assigning turf quality ratings and by plant, tiller and rhizome counts in some trials. Sod tensile strength measurements were also taken to determine development. Root production of

[1] John A. Jagschitz is Assistant Professor of Plant and Soil Science specializing in turfgrass weed research. C. R. Skogley is Professor of Plant and Soil Science specializing in turfgrass management research. Both are with the University of Rhode Island, Kingston.

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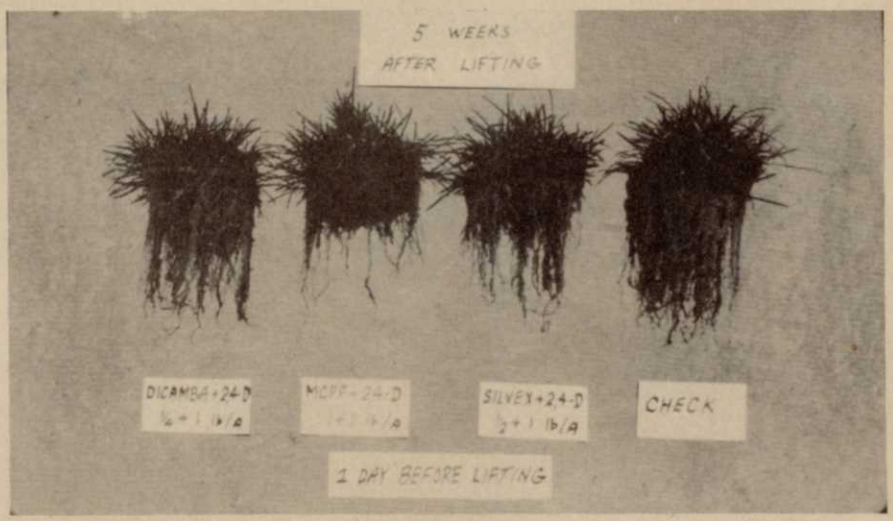
transplanted sod was evaluated by measuring dry weight of roots grown from four-inch plugs on sand. Root strength measurements were taken by recording the force necessary to lift sod plugs from soil.

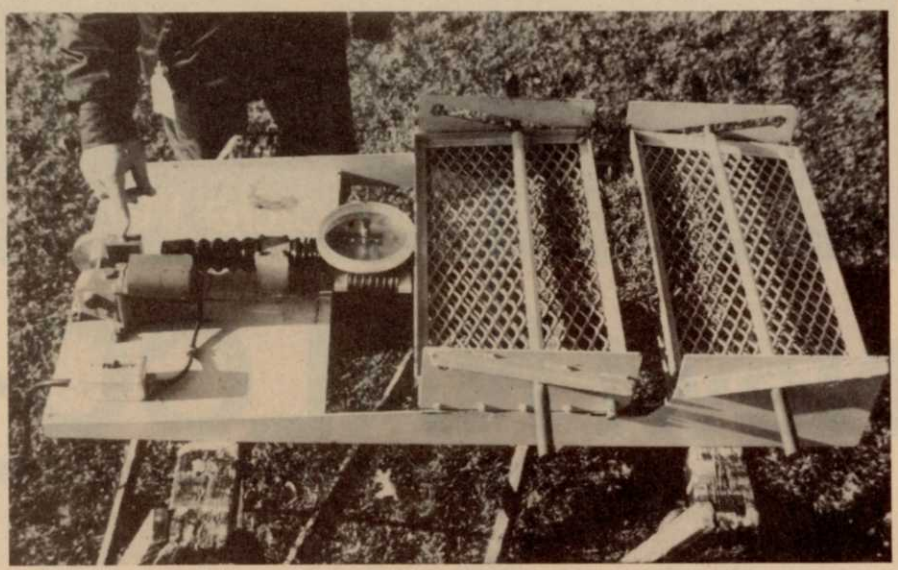
In another series of tests herbicides used for broad-leaved weed control were evaluated on mature sod. Standard rates of 2, 4-D spray mixtures with either dicamba (Banvel), mecoprop (MCPP) or silvex (2,4,5-TP) were applied in the spring and fall at various times before and after sod harvest. Rooting of the transplanted sod was evaluated by measuring root production and root strength.

Crabgrass herbicides applied to immature sod were not all beneficial. The grass treated with benefin and DCPA became coarser in texture and were of poorer quality within 2½ months of treatment. No visible adverse effects resulted from bensulide and siduron treatments. The tensile strength of sod, 2½ months after treatment, was reduced by benefin and, despite no adverse visual appearance, by bensulide. In fact, even five months after treatment, bensulide treated sod had reduced tensile strength. Tensile strength was not reduced by DCPA or siduron treatments.

In an effort to determine the influence of benefin and bensulide on plant development and relationship to sod strength, counts of plants, tillers and rhizomes were made 2½



Here are effects of herbicides on root growth of sod plugs grown for five weeks in pots filled with sand. Herbicides were applied one day before sod was lifted from the field and transplanted to pots.



This machine tests sod strength. A sod strip is clamped to the fixed stage at right and to moveable stage at left. When the machine is activated, the moveable stage is pulled to the left. The maximum force at which the sod breaks is measured by the scale in center of photo.

These sod plugs are transplanted and allowed to root. The rooted plugs are used to determine the force necessary to lift the plugs from the soil. The ring with the cross bar is placed under the plug and a nail is inserted so the cross bar can be located later for lifting.

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months after treatment. Benefin treatment on immature sod did reduce tiller and rhizome production. This could account for reduced tensile strength. There was no reduction in tiller or rhizome number with bensulide so it is possible that root production also influences sod strength.

When determining root growth of the immature sod transplanted four months after treatment is was determined that benefin, bensulide and DCPA inhibited rooting. No effect on rooting was detected with siduron treatment.

When the same four crabgrass herbicides were applied to mature sod no reduction in sod strength was noted when measured three months after treatment. Root growth measurements made at the same time showed inhibition only with bensulide.

On the basis of these trials it appears safe to use siduron for crabgrass control in young, developing stands of Kentucky bluegrass to be used for sod. On mature stands of sod results indicate that benefin, DCPA and siduron may be used safely for crabgrass control.

A sod plug is pulled from the soil to measure the force necessary to separate it from the soil. The metal hook is inserted through a nail hole and attached to the cross bar. A scale attached to the other end of the hook measures the maximum force necessary to lift the plug.

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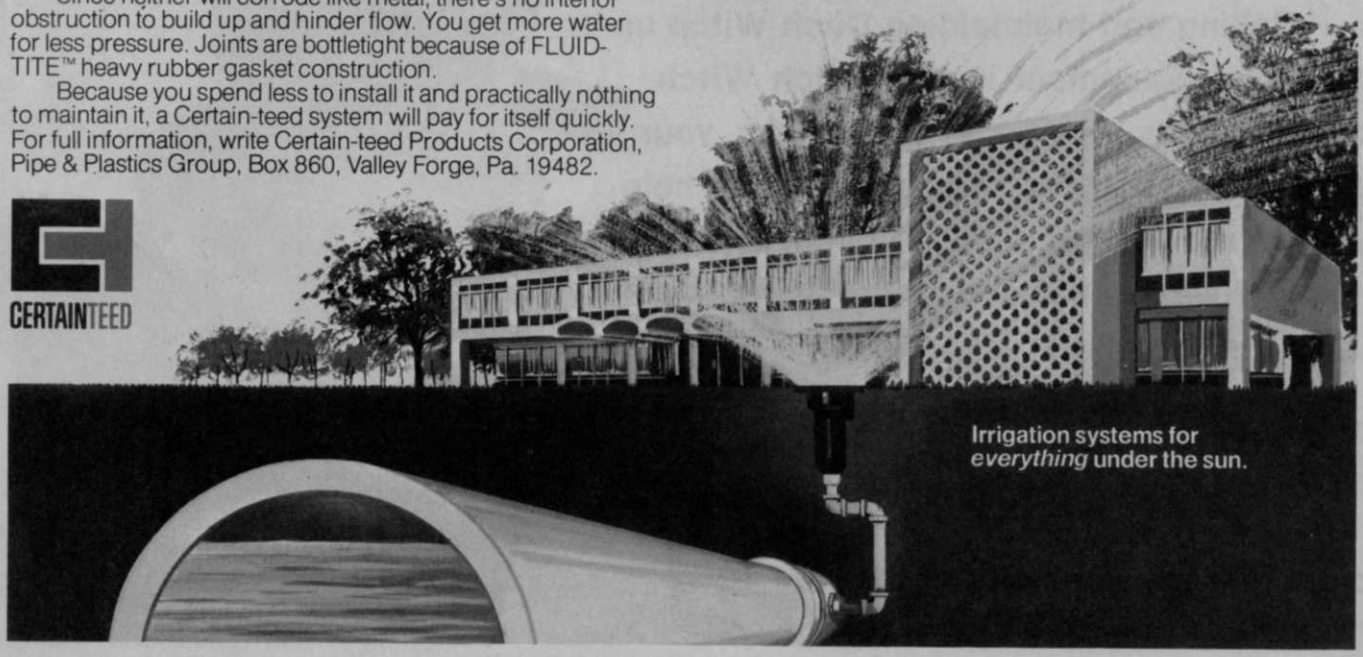

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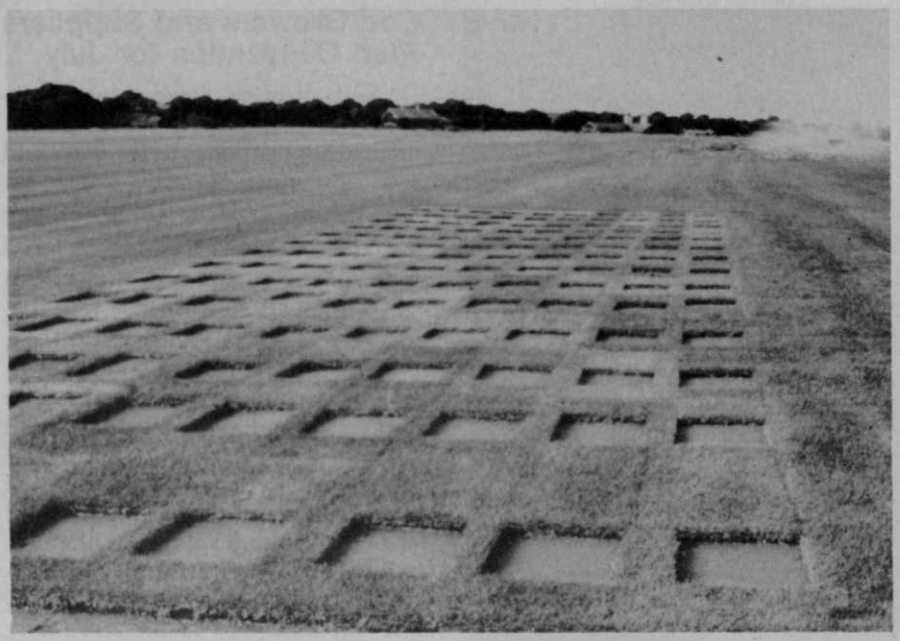

A view of an experimental sod plot after the sod was removed for strength tests or for transplanting to determine the effect of herbicides on rooting.

The broad-leaved weed control chemicals were applied only to mature turf. When used at the standard, recommended rates mixtures of 2, 4D with either dicamba, mecoprop or silvex applied four weeks before transplanting in the fall or spring did not effect sod rooting. Mixtures of 2,4-D with either mecoprop or silvex applied two weeks before harvest in the fall reduced root growth. No root inhibition was evident from the 2,4-D plus dicamba mixture. None of the three mixtures affected root growth from spring treatments made two weeks before transplanting.

All herbicide mixtures applied two weeks after sod installation in either spring or fall resulted in root inhibition. When the various mixtures were applied four weeks after transplanting in the spring there were no adverse affects on root growth. No fall treatments were made.

Conclusions based on results with the broad-leaved herbicides used on fully-developed sod are: (1) mixtures of 2,4-D with either dicamba, mecoprop or silvex can be used safely if applied at least four weeks before or after harvest. (2) if it is necessary to apply broad-leaved herbicide mixtures as close as two weeks before harvest it appears safe to use any of the three mixtures in the spring or 2,4-D plus dicamba in the fall. None of the mixtures should be applied within two weeks after transplanting in either spring or fall.

These studies should provide added assurance to commercial sod growers who rely on certain of the herbicides for effective and safe weed control.

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Sheraton Inn/Washington, N.E., 8500 Annapolis Rd., New Carrollton, Md., 20784, will host the American Sod Growers Association Convention on July 16-19.

Sod Growers and Suppliers Plan Convention for July

Sod growers have consistently faced problems of unstable prices, inconsistent supplies of fertilizer and seed and most recently, a near removal from their agricultural status by the Federal Energy Office.

The organization's 9th annual convention and field days is slated for July 16-19 at the Sheraton Inn, Washington-Northeast (located in New Carrollton, Maryland). The event gets underway Tuesday night with an open house at the exhibit arena from 6 to 10 p.m. where the latest in equipment, supplies and services will be displayed. Other activities planned for the meeting include equipment demonstrations, tours of local sod farms and many social activities.

The convention is open to all sod producers, supplier representatives and others interested in turfgrass production. For further information regarding registration, exhibiting, and ASPA membership, contact the American Sod Producers Association Bldg., 9th and Minnesota, Hastings, Nebraska, 68901.

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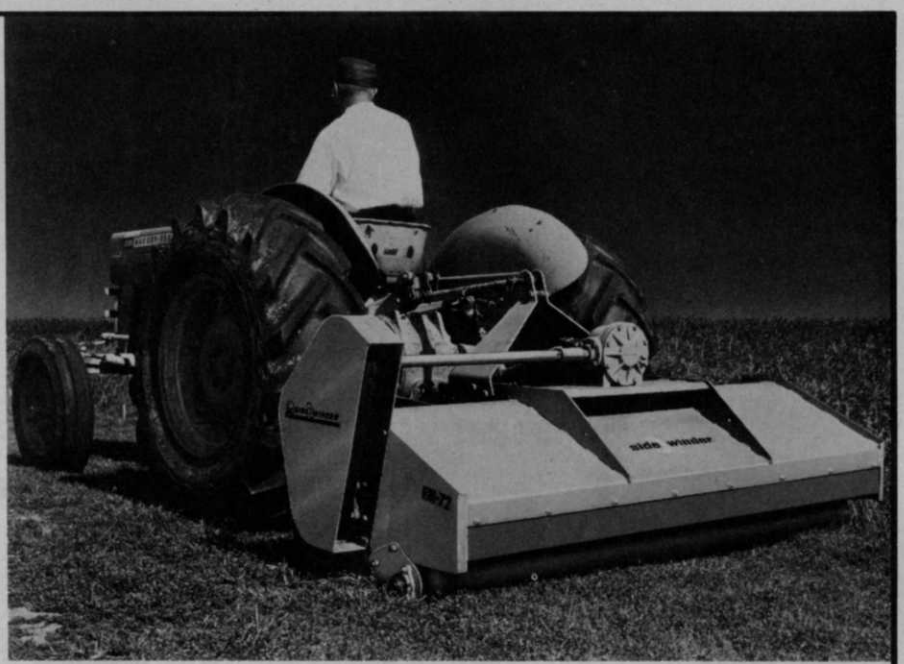

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Nematode Control: Wise Insurance

By JOHN WESELOH
Sales Manager
Dow Chemical Co.

The number 10 fairway at the Ocala, Florida Municipal Golf Course is lush with deep-rooted, abundant bermudagrass this year. But this is in contrast to the turf throughout the course when Jim Yancey came to Ocala less than four years ago. Nematodes, which feed on the roots of grass can either restrict the root system or can completely eliminate it, were taking their toll of the turf. They caused thinning of the grass and produced joy for the weeds. What was the answer? More water and fertilizer?

They didn't solve the problem, but a new nematicide did. Previously found to be successful in such farm crops as soybeans, Fumazone 86 was available and its application at Ocala for the past two summers "has made the Ocala golf course," Yancy said.

"The improvement of the course is unreal," Yancey said after two annual applications, "The 10th fairway had no grass previously, and now there is a good stand of grass. A couple other fairways are in the same improved condition."

Nematodes are easy for Yancey and other golf course managers to control because they need not purchase special application equipment nor train regular personnel to apply the material. The Ocala club contracts with Southern Mill Creek Products of Tampa to do the job. Other companies have good facilities, too. In late May or early June, Southern Mill Creek will come to Ocala again and treat the entire course, including tees, fairways, greens and roughs. The job will take two days and Yancey will close nine holes each day while the job is progressing.

The Ocala course is one of about 650 in Florida and Dr. G. C. Horn, a prominent golf course and turf management agronomist of Gainesville, Fla., believes Yancey is on the right track with his nematode control program. Horn ended a 23-year career as professor of turf management at the University of Florida to be a full-time consultant, and his chief interest is golf courses.

"The first symptom of nematode damage is that the turf loses its vigor," Horn said. "You fertilize it

Injection fumigation of golf course turf was found to be more effective for nematode control than the older drench method. The nematicide is injected into the turf at a depth of three to five inches using a Coulter and shank unit. Because special equipment is needed, most golf courses are treated by custom applicators.

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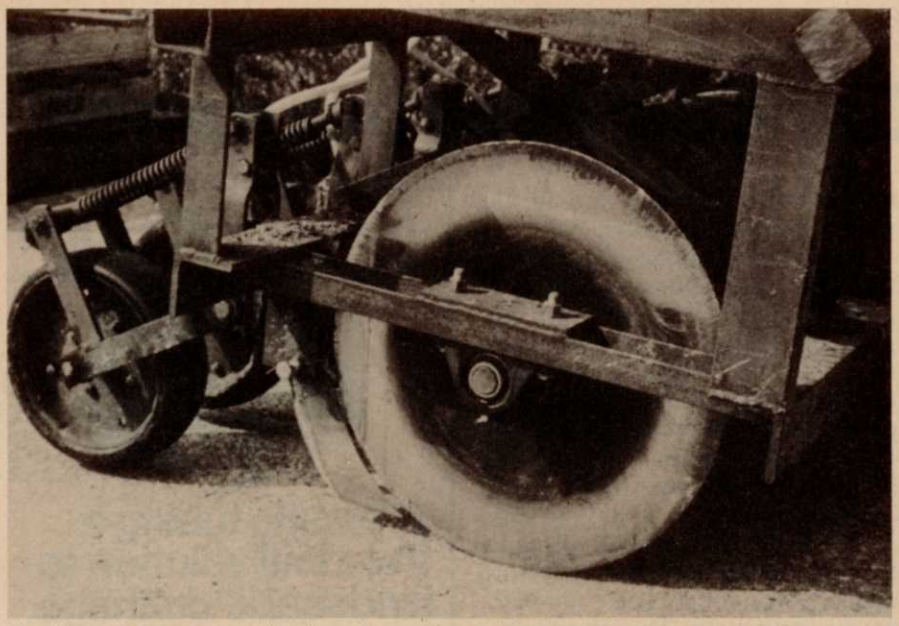
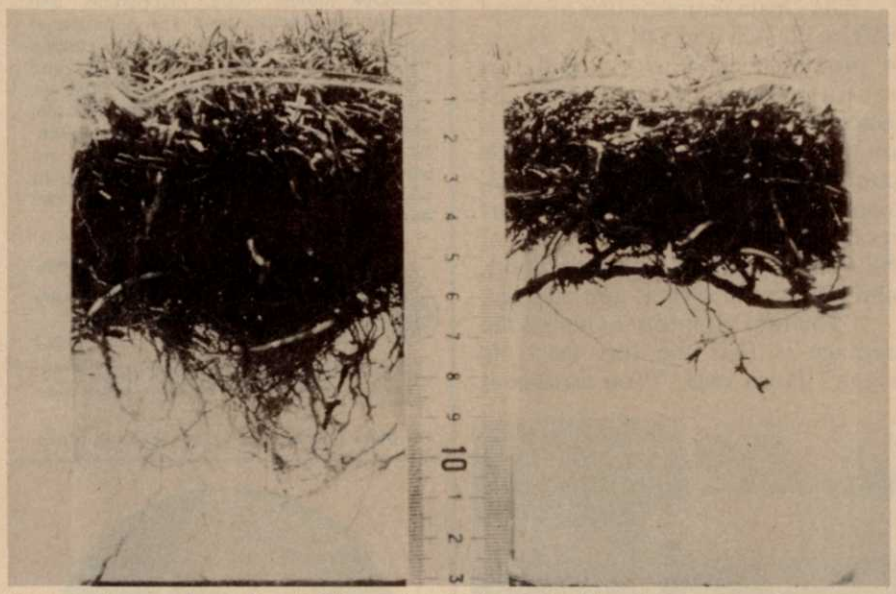


Equipment has been developed to treat golf course greens and fairways with nematicide. Injection is made on 10 to 12 inch centers with pack wheels behind to seal the slits.



Nematodes can keep the turf from developing a healthy root system. Fumagation controls the nematodes and allows a deep rooted system to develop. The left plug is the root system of grass treated with Fumazone fumigant; the right plug is untreated.

and it doesn't respond. The grass yellows from a defidiency of iron even when the soil may have plenty of iron in it, the grass has no roots to absorb the iron."

Another problem is that weed seeds abound in the soil and when the turf gets thin, the seeds germinate and weeds become a problem. One weed associated with nematode damage is the "milk weed" or spotted spurge. This weed will come onto a green when nematodes injure the turf, but it doesn't get a chance to grow if the turf is thick and vigorous.

Pioneer in nematode control on golf courses in Florida is Dr. V. G. Perry, Professor of nematology at the University of Florida. He began publicizing the problem about 1953 and developed some tests to determine the existence of nematodes in turf. After good responses from chemical injections with hand injectors, Perry and Horn turned to developing an injection machine. The early experimental models were inefficient and did a poor job. Some of the early chemicals burned the turf; however, improvements have been made in the last few years, and the mechanical and chemical problems largely eliminated.

Treatment of greens came first and even today golfers cringe a bit when they see application specialists roll over a green, slicing the immaculately conditioned Bermuda grass with sharp injector knives. Small garden tractors with dual back wheels and hydraulic lifts are used. Copper tubing in welded on the backs of the cutting blades and the nematicide passes through tubes by gravity flow or pressure into three-to-five-inch slits in the turf. The greens bounce back quickly from effects of the scalpel.

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More recently, treatment of fairways and roughs become practical with the design and construction of new, larger injection machines. These tractor injectors travel up to six miles an hour, enabling fairways and roughs to be treated twice as fast as greens. Though the knives do some damage to turf, recovery is usually rapid.

"Sometimes you can see some little streaks for as long as four weeks or more. If the turf is in poor condition, the streaks may be apparent for a couple of months," Horn said.

So effective is the nematicide treatment, said Horn, that an observer can see where the injectors entered the soil and where they were extracted. "If the applicator skips a three-foot swath, for example, you can pick out those three feet. Six months or a year later, you can still find the misses."

Golfing is big business in Florida, and Dr. Horn said about 40 courses a year are being added to the existing 650 courses. He estimates that 60 to 70 per cent of the greens and about 25 to 30 per cent of the fairways are being treated annually with a nematicide. Horn estimates that about 10 per cent more courses will be treated with Fumazone nematicide this year, with perhaps another 15 to 20 per cent the following year.

"There are very few public, municipal or private golf courses in Florida that haven't at least treated some of the greens," the consultant said. "Treatment had not been this extensive on fairways, however, if nematodes exist in numbers sufficient to cause damage, the turf does very poorly and should be treated."

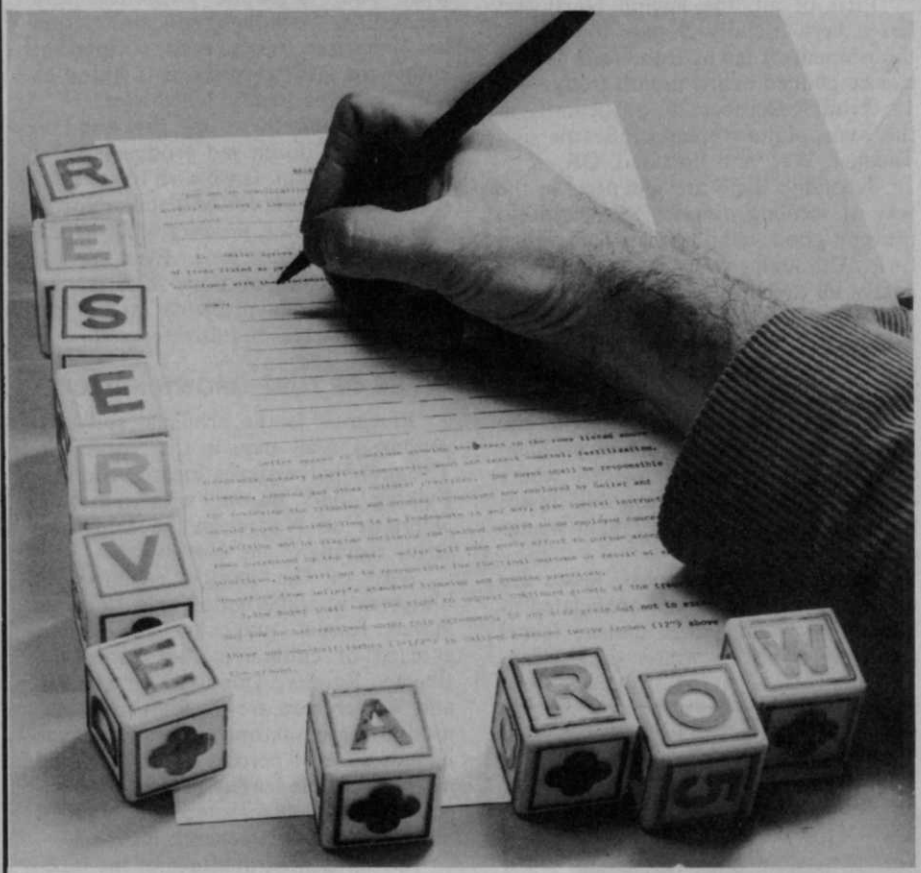
Cost of treating greens in Florida is about $7 or $8 a thousand square feet. Horn said a superintendent can get by fairly well with treatment of putting surfaces alone. "But, again, it gets back to the fact that if you treat the green and not the immediate surrounding area, you're going to have a good looking green and poor slopes."

Use of a nematicide throughout a golf course in Florida ranges from $3,000 to $9,000. Yancey said the treatment cost at Ocala is about $3,500 a year.

Horn recommends treatment where known nematode problems

(continued on page 52)

Jim Yancey proudly points out the well-manicured turf on green number 4 at his golf course in Ocala, Fla. Yancey, club pro and greenskeeper, is the older brother of professional golfer Bert Yancey.



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Sod Production in

By ROY L. GOSS
Agronomist
Washington State University

Sod production began in Washington, the first Pacific Northwest producer, in 1962. Emerald Turfgrass Farms at Sumner, Washington was the first producer that has stayed in business and had its beginning on 25 acres. At the present time Emerald operates about 250 acres of cultivated and specialized sod and stolons. It is estimated that there are seven or eight producers growing about 1,000 acres of cultivated sod. Perhaps there are several reasons why sod production isn't a larger industry when compared to Michigan.

First of all, the Pacific Northwest has a very friendly climate for the establishment of lawns from seed. Lawns can be planted in any month from April 15 through October 20, particularly in the metropolitan areas of Seattle and Tacoma, WA, and Portland, OR.

Secondly, there are few pests in the way of seedling diseases and weeds to prevent good establishment of seeded turf. Although crabgrass is found in nearly all areas of the Northwest, it is not a serious problem to the establishment of turf. Summer turfgrass diseases are not significant to the manager of fine turf.

Winter losses of turfgrasses in the Northwest is not a significant problem except in the interior regions where colder winters causes variable losses from snow mold and occasionally winter desiccation.

Along the Pacific coast, losses are not highly significant and are related to minor Fusarium Patch disease losses and only rarely to winter desiccation. Well-designed and applied fungicidal programs help to make disease losses rather minor in all areas. Perhaps another reason, and perhaps the most significant for the lack of demand for good sod, is public awareness and promotion. Although sod production has increased more than 50 percent within the last five years, it is still in its infancy in the Pacific Northwest.

In Canada there are probably no more than a dozen sod producers West of Saskatchewan. If we wish to consider Alberta as a part of the Pacific Northwest, their major producers lie in the Calgary-Edmonton area. Even so, the total production of both Alberta and British Columbia probably do not exceed 1,000 acres of cultivated sod.

TYPES OF TURF GROWN FOR SOD

Bluegrass is the principal sod type produced in all areas of the Northwest. The principal varieties include Merion, Fylking, and Baron, with increased emphasis on Nugget in the colder interior regions of the Northwest.

Any of the named varieties of bluegrass in combination with the fine-leaved fescues make up the largest acreage of cultivated sod. Pennlawn, Illahee, Rainier, Dawson, Jamestown, and Wintergreen are the major varieties used in these mixtures. Some producers include up to 30 percent of the total seed mixture as fine-leaved fescues to compensate for shade tolerance that many of the bluegrasses, in general, lack.

More recently, mixtures of the bluegrasses and turf-type ryegrasses such as Manhattan and Pennfine have gained popularity for specialized uses such as athletic fields, playgrounds and park areas. Winter hardiness of the ryegrasses has not been a problem in the western portion of the Northwest, but have not proven to be highly popular in the colder interior regions. Ryegrasses maintain better growth and color during the fall and winter months west of the Cascade Mountains, hence, the popularity for this type of mixture. Red thread disease caused by the fungus *Corticium fuciforne* is probably the greatest weakness of the ryegrasses along the West Coast area.

Stolon production is very limited. To my knowledge, only Emerald Turfgrass Farms produces stolons for specialized uses on golf course putting greens. The variety Toronto is the only stoloniferous type produced, however, some Old Orchard is shipped in from California producers.

SOIL TYPES FOR SOD PRODUCTION

Nearly all sod in the Pacific Northwest is produced on mineral type soils. Soils vary from loamy sands to silt loams. Little or no production occurs on peat or muck soils. Sod producers on the Northwest coast experience heavy rainfall during fall, winter and early spring, making peat soils difficult to manage during this period of time since mowing must be practiced in nearly all months of the year.

Although it requires more time to produce a saleable crop of sod on lighter soils, harvesting operations can proceed at any time the ground is not forzen or snow covered. This is not a significant factor west of the Cascade Mountains, although no harvesting occurs in areas east of the Mountains from, perhaps November 1 through April 15.

PRODUCTION AND HARVESTING

Sod fields are normally planted at the rate of 70 to 100 lbs. of bluegrass or bluegrass/fescue mixtures per acre. Brillion drills are predominately used for planting. No sod is reproduced from rhizomes or other vegetative material.

Fertilizers are applied prior to planting based upon soil tests. Normally preplant applications of 10-20-20 at the rate of 400-500 lbs. per acre are provided, after which nitrogen only is applied to produce the crop.

Nitrogen applications are made every five to eight weeks throughout the growing season to maintain vigorous growth and development. The average sod crop on sandy soils receives about between 250 to 275 pounds of nitrogen per acre before harvesting. Liming is practiced only on acid soils west of the Cascade Mountains where soil tests indicate the need.

Most irrigation is practiced with either portable handsets or portable wheel moves. Little solid set irrigation except for establishing new fields is practiced in the Northwest. Some farms practice laying out solid sets on newly seeded fields until they are ready for the first mowing, and then removed and replaced with wheel sets.

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the Pacific Northwest

Mowing is usually accomplished with pull-type units of 5, 7 or 9 gangs. Some producers in the higher rainfall areas west of the Cascade Mountains use very high flotation tires on tractors used for gang units, fertilizer application, or other operations in the field. Rear tires up to 42 inches wide make mowing operations possible when soils are soft and wet.

Harvesting is accomplished with a wide variety of equipment. Some smaller farms cut with 18 inch hand operated power cutters while others use the Nunes, Brouwer, or Princeton sod harvesters.

MAJOR PROBLEMS

Poa *annua* is by far the single most important problem in sod production. All fields planted to premium quality sod must be fumigated with methyl bromide at 300 lbs. per acre prior to planting. This costs the sod grower about $300 an acre by the time the tarps are retrieved from the land. Even this does not guarantee freedom from Poa *annua* invasion. Some tests have been made with tricalcium arsenate as a post-emergent eradication treatment with varying success considering variable soil types and soil drainage.

The sod producer has little control over the destination of the grass grown, since little sod is installed by producers. Frequently, bluegrasses are sodded in areas with too much shade and results in unacceptable lawns and occasionally complete losses. Bluegrasses sodded on putting green aprons produces a striking contrast with fairway types and is sometimes criticized.

Soil incompatibility on high use playfields is frequently a problem. The better football fields in the Pacific Northwest today are built from sand and organic material. Sod grown on soil heavier than loamy sand does not readily transmit precipitation unless intensively managed. Some producers are presently growing sod on sand which has been hauled in for premium quality athletic fields. This obviously increases the price of the sod to the consumer, but many feel this is a wise investment.

One other problem facing sod producers in the metropolitan areas of Seattle and Portland is high land costs and taxes. Land suitable for sod production in these areas is valued from $2,000 to $7,000 per acre. Land rent for the same land runs from $80 to $100 per acre with the renter participating in part of the taxes.□

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meeting dates

Purdue University Weed Day, summer tour, Purdue University Agronomy Farm, W. Lafayette, Ind., June 25.

American Society of Landscape Architects, 74th annual meeting, American Hotel, Bal Habour, Miami Beach, Fla., June 30 - July 4.

International Drip Irrigation Congress, 2nd annual meeting, San Diego, Calif., July 7-14.

American Association of Nurserymen, annual convention, Four Seasons-Sheraton Hotel, Toronto, Ont., July 13-17.

Hyacinth Control Society, Inc., Langford Hotel, Winter Park, Fla., July 14-17.

American Sod Producers Association, summer meeting, Sheraton Inn-Northeast, Washington, D.C., (New Carrollton, Md.) July 16-19.

Turfgrass Research and Equipment Field Day, University of Maryland Plant Research Farm, Fairland, Md., Aug. 8.

Ohio Turfgrass Field Day, Ohio State University, Columbus, Ohio, Aug. 8.

American Society for Horticulture Science, 71st annual meeting, and **Canadian Society for Horticulture Science,** 19th annual meeting, University of Guelph, Ont., Aug. 11-17.

International Shade Tree Conference, Golden Anniversary meeting, Atlanta, Ga., Aug. 18-23.

National Hardware Show, 29th annual show, New York Coliseum, New York, N.Y., Aug. 25-29.

Professional Grounds Maintenance Society Conference, annual meeting, Crown Center Hotel, Kansas City, Mo., Sept. 4-6.

International Plant Propagators' Society, Western Region, 15th annual meeting, Mission Bay area, San Diego, Calif., Sept. 4-6.

Northern Michigan Turfgrass Field Day, Michigan State University Experimental area, Sept. 10.

Lawn and Garden Distributors Association Convention, annual meeting, Fairmon-Roosevelt Hotel, New Orleans, La., Sept. 11-12.

Florida Turf-Grass Association, combined conference and show, Curtis Hixson Convention Center and Riverside Hilton, Tampa, Fla., Sept. 16-19.

Midwest Agricultural Chemicals Association, annual meeting, Four Seasons, Lake Ozark, Mo., Sept. 17-19.

International Pesticide Applicators Association, Seattle, Wash., Sept. 18-21.

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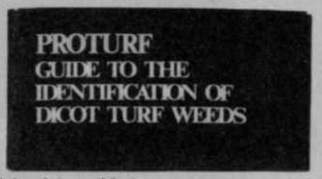

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Hyacinth Control Society Meets July 14-17

AQUATIC WEED management and research will highlight the '74 annual meeting of the Hyacinth Control Society at Winter Park, Fla., July 14-17.

Headquarters will be the Langford Hotel, a block from the downtown Winter Park area. Activities begin Sunday evening.

This Society is the only major group in the nation which devotes its total program to aquatic weed programs. The formal sessions include both technical research and field experience presentations. In fact, the group has been forced to develop a program of concurrent sessions during each afternoon. One session is devoted to technical data, the other to operations and field techniques. General sessions will remain the norm for the morning programs.

Aquatic plants become more and more important during recent years in areas other than the Southeastern US and both the program and the attendance reflect this change. Members and guests attend from throughout the US and several foreign countries each year.

Anyone concerned with aquatics is welcomed by the membership. Registration is $35. Wives may attend for an additional $15 registration fee. The Board has authorized a 10% discount on these fees for preregistration prior to June 30. Checks may be sent to the Society secretary, T. W. Miller, Jr., Post Office Box 2237, Fort Myers, Fla. 33902.

Hotel registrations may be made direct to The Langford Hotel, E. New England Ave. and Interlachen Ave., Winter Park Fla., 32789. Single rates begin at $16.50 with $5 for each additional person. A deposit is required to guarantee space.

Cancellations will be refunded for registration until July 10 and by the hotel until 48 hours prior to the meeting.

Details can be obtained from Dr. Alva P. Purkhalter, president of the Society, and also in charge of local arrangements. His address is Department of Natural Resources, Larson Building, Room 595, Tallahassee, Fla. 32304.

Dawn Attack . . . On Hydrilla

By DOUG JONES, Applied Biochemists, Inc., Mequon, Wis.

Hydrilla, a prolific strangler of Florida's inland lakes and waterways, continues to resist control efforts.

Those attending the Hyacinth Control Society convention in Winter Park, Florida, July 14-17, will learn first-hand of progress to date in hydrilla control.

Applied Biochemists, Inc., a Mequon, Wisconsin firm, was among the first (starting in 1970) to engage in serious testing for a chemical control of hydrilla. The story Applied Biochemists, Inc. will tell in Winter Park is that of the new CUTRINE-PLUS, its vastly improved copper triethanolamine, algaecide which, in combination with Diquat or Aquathol-K, has become important in hydrilla control.

Since hydrilla came to the forefront as an aquatic crisis problem, chemicals have shared the experimental spotlight with insects, fish, and mechanical devices in an all-out effort to control its spread. (WEEDS TREES and TURF, October, 1972, reported an isolated hydrilla infestation in an Iowa farm pond.)

Each type of control has shown some promise, and more work is needed. Chemicals appear to show the most immediate success in at least controlling growth.

Buying time while maintaining a year-to-year plant knockdown is perhaps a better way to state the assumption.

The CUTRINE testing program was conducted with the cooperation of Robert "Doctor Bob" Blackburn and his U.S.D.A. associates at the ARS station in Fort Lauderdale, Florida. Blackburn has expanded his work to include other chemicals and chemical combinations, and will report on his work at the Winter Park meeting.

Field tests on CUTRINE and Diquat were conducted in 1972. Using a combination of four gallons of CUTRINE and two gallons of Diquat per acre, applied by dragging hoses along the bottoms of lakes and across hydrilla beds, good results were obtained. In the test plots, observed by scuba divers, the combination showed an average of 83 percent control of hydrilla after 30 days.

Attesting to the severity of the problem, following a positive result observation after 60 days, little control was noted after 90 days. So, while the CUTRINE/Diquat system provided excellent short-term results at economical cost per acre rates, and with little or no harmful effects on invertabrates which make up the fish food chain, it was obvious a perfect solution was not yet at hand.

In 1973, Applied Biochemists, Inc. received federal registration for CUTRINE-PLUS, a more stabilized copper complex which has proven to be 50% more effective than CUTRINE. The product contains 9.0% active copper compared to CUTRINE's 7.1%, reduces cost per acre treated, and eliminates the sulfates which some users had found objectionable.

Armed with a better, less costly weapon, Applied Biochemists, Inc. contacted the major governmental and private agencies responsible for

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aquatic nuisance control, and the stage was set for the 1974 hydrilla control season.

Early reports are that both the CUTRINE-PLUS/Diquat and CUTRINE - PLUS / Aquathol-K combinations are working well. The latter method was first tested in the summer of 1973 with the expected mixed results. More definitive data will come from another season in the field and, if the combination proves as predicted, it will provide even greater economies in treatment.

Basically, it is recommended that 3-1/3 gallons of CUTRINE-PLUS be combined with two gallons of Diquat for hydrilla control, a cost of approximately $90 per acre foot. Due to the increased compatibility of CUTRINE-PLUS with Diquat, it may be possible to reduce the ratio to 1 ½ gallons of CUTRINE-PLUS to two gallons of Diquat, and a $70 per acre foot cost. Experimentation by the user will result in the best combination.

Two gallons of CUTRINE-PLUS and two gallons of Aquathol-K is standard for hydrilla control at a cost of $45-50 per acre foot. Again, experimentation will prove the key.

In all cases, above costs should be tempered by the steadily increasing cost of chemicals. However, these combinations at this time provide the lowest cost for treatment. Method of application likewise varies with the type of water body to be treated.

For example; the massive and extensive canals and waterways in Florida have raised the question as to the fastest and most efficient method of treatment. In the southeastern section of the state, one answer has been the helicopter.

A nurse truck, loaded with premixed chemical, is used for tank refill on one of Southeastern Heliocopter Service's choppers. The truck follows landward as the aircraft treats the weed-choked canals.

Early treatment of hydrilla by helicopter, using CUTRINE-PLUS and both Diquat and Hydrothol-K, has proven to be efficient.

The procedure consists of a helicopter pilot and crew usually beginning at daylight. On the day prior to treatment, a tank truck is loaded with premixed chemical. It follows landward as the aircraft treats the weed-choked canals. Weight is an important factor for the helicopter, with an 80-gallon chemical load about maximum for each series of passes. The 80 gallons amount to about 720 pounds, and often the pilot will carry only enough gasoline to fly that much material on the canal.

Thus, frequent re-loading, both of chemical and gasoline, are required, since the helicopter is rigged with only a 10-foot wide application boom.

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For More Details Circle (139) on Reply Card

Surface craft treatments, many times involving air boats, are common and usually accomplished by using the invert or bivert applications.

Invert and bivert methods, in which the chemicals are mixed with an oil-based emollient, eliminate drift problems. The chemical is released through hoses trailing the boat. Some applicators prefer releasing the chemical several inches below the water surface, allowing the weight of the chemical to drop throughout the water spectrum. Some prefer dragging across the plants at the bottom. Either way, the oil emollient permits the active chemical to cling to the hydrilla.

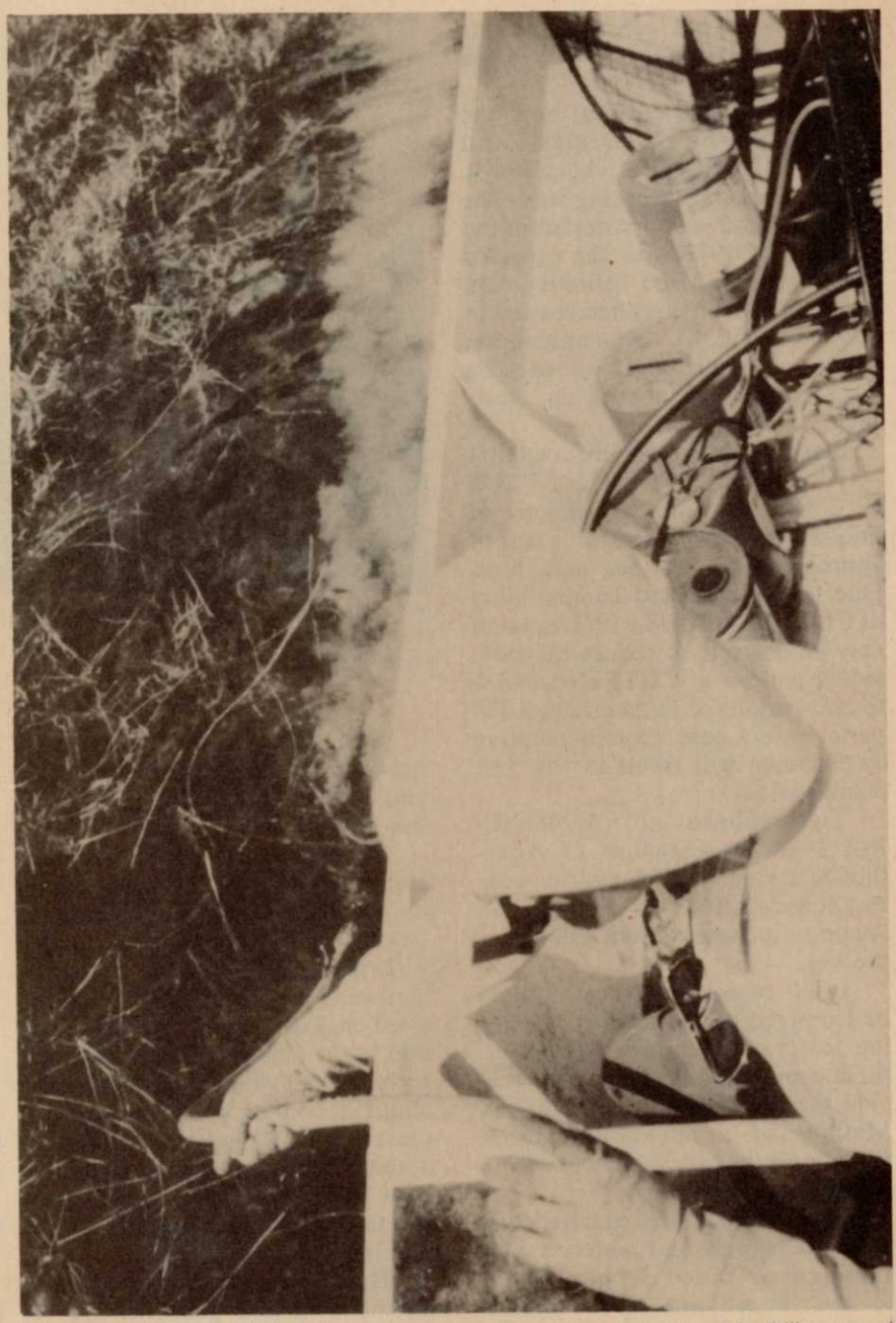
Spray treatment is the oldest method, and is still widely used. Vinnie Diaz, aquatic weed foreman for the city of Margate, Florida, is one who utilizes this method with great success.

For hydrilla control, Diaz makes 200-gallon batches of CUTRINE-PLUS and Diquat on a 5:2 ratio, diluting with water. Using a John Bean rig, he can cover two acres of water, spraying from the shoreline out.

Diaz also has had good results applying CUTRINE-PLUS by itself for control of chara, the weed-like bottom attached algae. He mixes 1.2 gallons of CUTRINE-PLUS in 100 gallons of water, enough to spray one acre.

He reports "great" results on both chara and hydrilla. The chara is normally controlled within two weeks, hydrilla knockdown occurring within a few days.

In general, those who are using a CUTRINE-PLUS/herbicide combination in Florida this year are experiencing hoped for results in about two weeks.



The Broward County (Fla.) Water Resources Department applies a hydrilla-control chemical mixed with an oil-based emollient. Surface craft treatments using the invert or bivert methods eliminate chemical drift problems.

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Horrible Things Are Happening To Hydrilla

CUTRINE-PLUS

In combination with Diquat or Aquathol-K

Is winning Florida's weed war

Find Out How At Area "F"

Langford Hotel — Winter Park

Hyacinth Control Society Meeting

Applied Biochemists, Inc., Mequen, Wisconsin

For More Details Circle (142) on Reply Card

insect report

TREE INSECTS

NANTUCKET PINE TIP MOTH

(Rhyacionia frustrana)

MARYLAND: Adults active and ovipositing in all areas of State east of Washington County. Above normal populations and damage expected this season.

NORTHERN PINE WEEVIL

(Pissodes approximatus)

OHIO: Mating observed on stumps of Scotch pine in Portage County area. Feeding on branches and stems of seedlings will continue for brief period before returning to stumps for oviposition. Treatments should be applied.

EASTERN SPRUCE GALL APHID

(Adelges abietis)

OHIO: Overwintering females fully developed on Norway and white spruce in Stark County area. Chemical treatments should be applied.

PINE BARK APHID

(Pineus strobi)

SOUTH CAROLINA: Infestations heavy on 15 of 100 Pickens County white pine trees. Treatments planned.

MAPLE LEAFCUTTER

(Paraclemensia acerifoliella

NEW HAMPSHIRE: Collections of leaf litter made in Sugar maple *(Acer saccharum)* orchards at Acworth and Langdon, Cheshire County, and at Gilford, Belknap County, indicate low mortality of overwintering forms.

EASTERN TENT CATERPILLAR

(Malacosoma americanum)

NEW HAMPSHIRE: Eggs hatched at Durhan, Strafford County, NEW YORK: Eggs hatched in parts of Onondaga, Oswego, Madison, and Cayuga Counties. KENTUCKY: Infested several species of trees (mostly wild cherry) in all sections of State. Tents obvious and feeding apparent.

BENEFICIAL INSECTS

LADY BEETLES

FLORIDA: *Hippodamia convergens* (convergent lady beetle) counts per 100 sweeps averaged 12 adults with some larvae in oats and 4 adults in alfalfa at Gainesville, Alachua County. ARKANSAS: Lady beetle adults found in almost all green vegetation but populations not increasing significantly. Larvae still light. Cool nights probably holding reproduction to light level. OKLAHOMA: *H. convergens* heavy in aphid infested alfalfa in some areas in southwest counties.

TURF INSECTS

SOD WEBWORM

(Crambus trisectus)

MARYLAND: First spring activity noted in 60 acres of bluegrass in Harford County and 20 acres of sod in Prince Georges County. Larvae ranged 1-2 per square yard of sod in Prince Georges County.

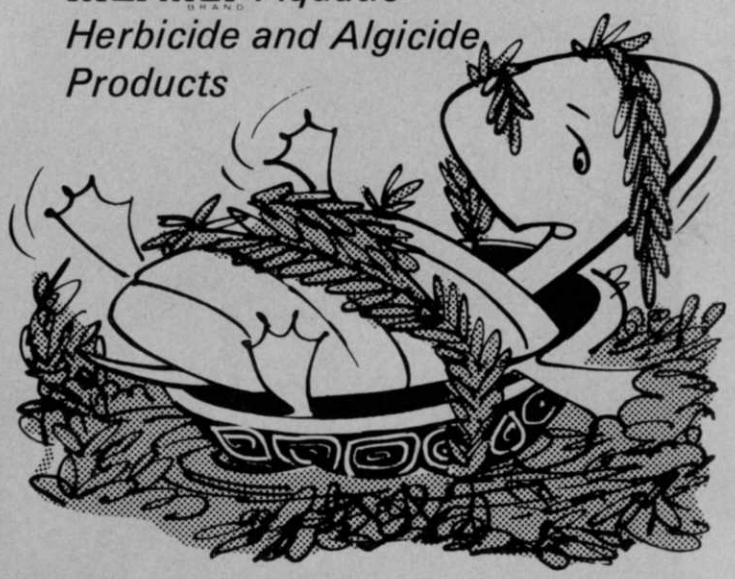
TEXAS LEAFCUTTING ANT

(Atta texana)

TEXAS: Damaged lawns in Bexar and Lee Counties.

WHEN WEEDS and ALGAE MAKE LIFE MISERABLE...

it's time you found the **Mariner** BRAND *Aquatic Herbicide and Algicide Products*



For information on this new and growing line of 3M aquatic weed and algae control products, write: Plant Care Systems, 3M Company, 3M Center, P.O. Box 33050, St. Paul, Minn. 55101. Or call 305/943-0481.

3M COMPANY

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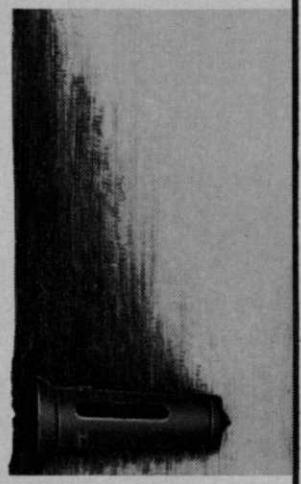
Leading university researchers confirm effectiveness of Iron Medicaps in treating Chlorosis. Nothing else works as fast or gives the lasting control that Medicaps provide.

Medicaps are inserted into small injection holes in the tree trunk. Chemicals are released directly into the sap stream from the Medicap. The tapered head of the Medicap seals the hole, promotes healing. It takes only 3 Medicaps and less than 10 minutes to treat a 5-inch diameter tree . . . and most trees show improvement in 3 weeks or less.



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industry news and newsmakers

Robert Davidson (right), president of the Southern California Turfgrass Council, presents a $3,000 check to Dr. Victor B. Younger (left), professor of agronomy at the University of California, Riverside (UCR). The check represented the turf industry's initial grant in support of turf research at UCR. Looking on is John A. Van Dam, Cooperative Extension farm advisor with turfgrass responsibilities. The presentation was made during the banquet program of the 1974 Turf and Landscape Institute Anaheim.

Ohio Names Martin

David P. Martin was named executive secretary for the Ohio Turfgrass Foundation (OTF) at their recent board of trustees meeting. The appointment was necessitated by the resignation of Robert W. Miller.

Miller had been the foundation's only previous executive secretary, having served since 1966. The new secretary's duties include coordinating the 1974 Ohio Turfgrass Conference and Show, publishing several newsletters during 1974 and more clearly defining responsibilities for OTF committees.

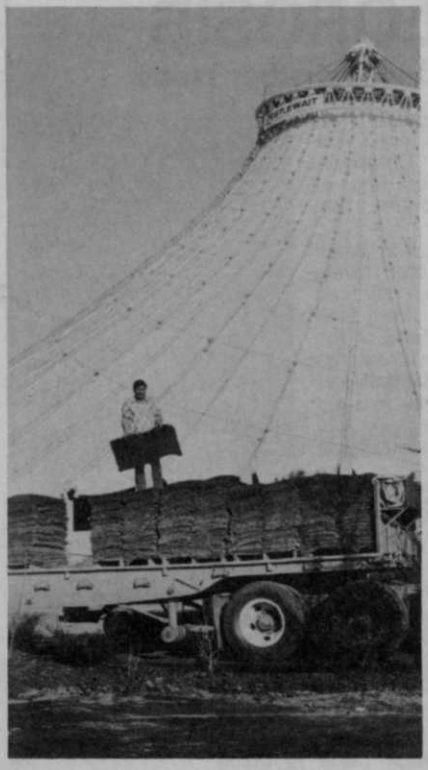
San Diego Drip Exhibit Slated for July 11 - 13

One of the newer innovations to appear on the irrigation market has been the drip concept. Little more than a novel idea for watering plants four years ago, it has spawned a highly competitive business among today's irrigation equipment manufacturers.

New drip equipment is appearing on the market almost monthly. A nurseryman or sod grower interested in drip irrigation has some 40 different water emitters from which to choose for his particular drip system operation.

Most of the emitters now being manufactured can be seen in the office of Sterling Davis, agricultural engineer with the U.S. Department of Agriculture — Agricultural Research Service, at the University of California, Riverside.

"There isn't a dripper here that won't work satisfactorily providing its water source is cleaned up and



Foy Resumes Position

Dr. Chester L. Foy, Professor of Plant Physiology at Virginia Tech, has been reappointed as associate editor of **Weed Science,** the official bimonthly professional journal of the Weed Science Society of America (WSSA). Foy has served the society in an editorial capacity intermittently for about 15 years.

Fylking, Official Grass of Expo '74

While Expo '74 World's Fair visitors are admiring the fabulous displays and exhibition centers they will be walking on Fylking Kentucky bluegrass.

Flyking (being unloaded at left) was chosen as the fair's official grass for its beauty and hardiness, two factors necessary to insure pleasant surroundings while withstanding heavy pedestrian traffic from the projected 4.8 million visitors.

The sod was grown by the Rede Turf Sod Farm, Hubbard, Ore., from see donated by Jacklin Seed Co., Spokane, Washington. The sod is unloaded in preparation for laying throughout the 100-acre site.

The fair, located on two islands and on the banks of the Spokane River in the heart of downtown Spokane, will be transformed to a city park after the exposition.

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Without proper control, waterweeds and algae can:

1. Restrict or clog irrigation equipment.
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3. Create an imbalance in fish population.*
4. Limit swimming enjoyment.*
5. Tangle fishing lines.*

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Hydrothol 47 is easy to apply. It is effective, fast acting and biodegradable. It does not accumulate in fish or build up in water or on lake bottoms. It controls most algae, including Chara.

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managed right," Davis said. "That's the important thing about drip irrigation, of course, cleaning up the water, using an adequate filtering system."

Davis says the emitters can be grouped into these classifications:

(1) **The long passageway.** Water travels around a spiral within each emitter,or a long tube, slowing from friction, to reduce the water head, or pressure.

(2) **The small diameter insert.** A tiny plastic nozzle is inserted into plastic water tubing. Sometimes the tubing has a protective flap to keep dirt from the nozzle.

(3) **Flushing.** The emitter has a ball or other device to control the water. When water first enters from the supply line, it can flow freely, flushing out the opening. As pressure builds up in the line, the ball closes the large opening, leaving only a tiny orifice for water emission.

(4) **Line sources.** The supply line, either of plastic or ceramic material, oozes water through small openings at a set rate according to the pressure within. This system can sometimes be flushed by increasing the water pressure temporarily.

(5) **Adjustable.** The emitter can be individually adjusted for water flow.

(6) **Twin wall.** This system consists of a double tube. The inner tube, about an inch in diameter, carries the main water supply. Water leaks through holes at regular intervals into the smaller passageway in the outer tube. From this outer passageway the water escapes through the outer wall, which has about four times as many holes as the inner wall, under greatly reduced pressure.

Small emitter orifices and low water pressure are common to most systems, Davis noted. All of them require pressure control and filtration systems.

The 2nd International Drip Irrigation Congress in July, meeting at San Diego's Sheraton Harbor Island Hotel, will have the most comprehensive exhibition of drip irrigation equipment of any showing to date, according to Davis. The equipment exhibits will open July 11 and remain on display through July 13.

More than 90 papers will be presented during the Congress program. Researchers from 14 foreign nations and the U.S. will present papers categorized into

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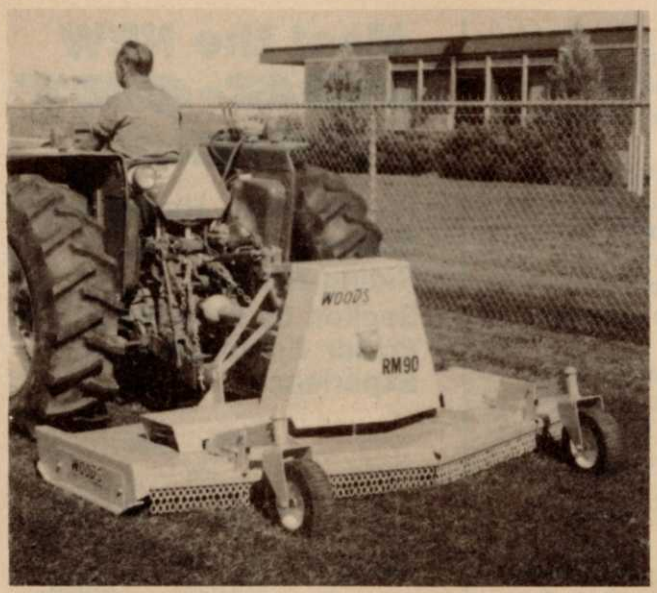
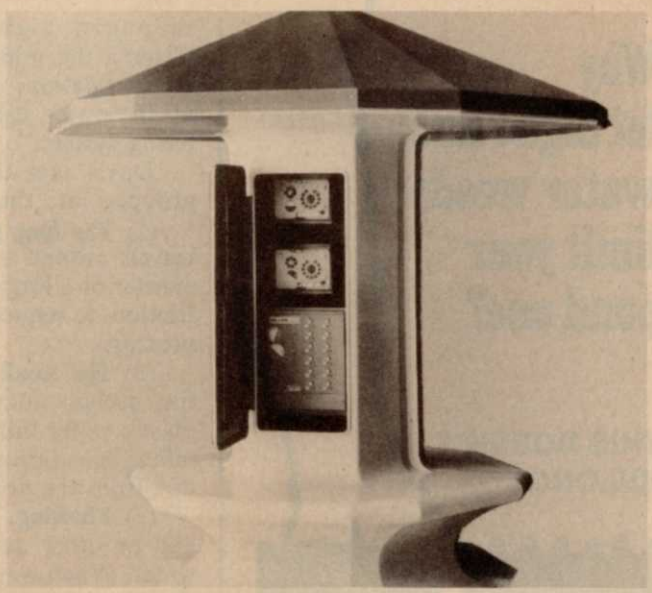


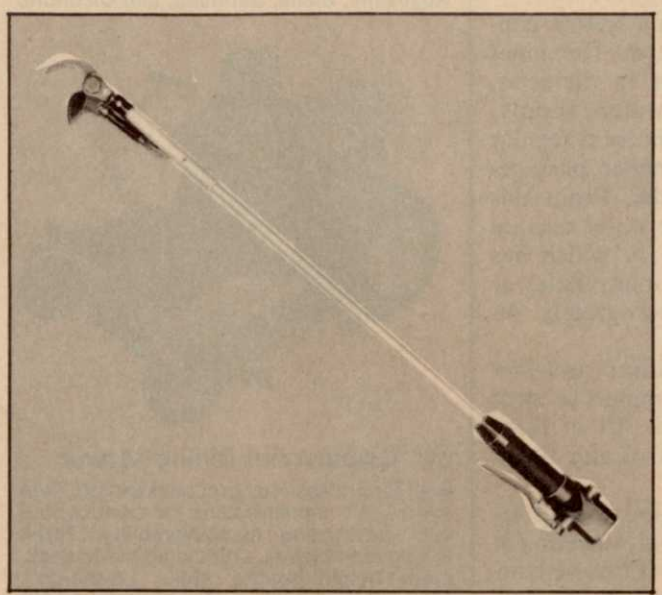
REAR-MOUNTED LAWN MOWER: Woods Division of Hesston Corp., Oregon, Ill.

The new model RM90 covers a 7 and one half foot cutting swath. The blades overlap for a smooth, clean cut that leaves turf with a freshly manicured appearance. The 3-point hitch hook-up is designed for fast, easy and safe attachment to tractors with 25 to 50 HP ratings. For more details, circle (709) on the reply card.



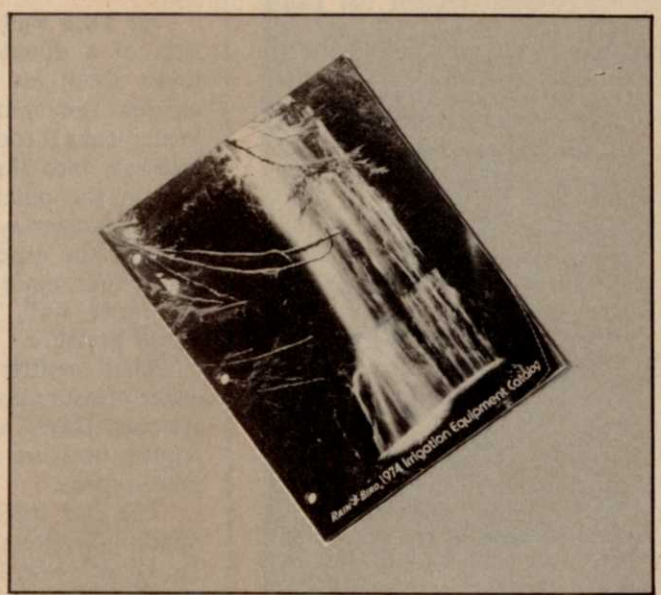
NODE-A-BODE: F.G.F. Corp., St. Charles, Ill.

Here's a golf course irrigation shelter that doesn't look like a big green tombstone. This unit is constructed from tough fiberglass and doubles as a tee bench. The overall height is 8 and one half feet with a roof diameter of 8 feet. It is available in a choice of colors for both roof and body to blend with any landscape. For more details, circle (710) on the reply card.



TREE PRUNER: New Draulics, Inc., Salt Lake City, Utah

This lightweight pruner bites off two inch thick branches instantly. The powerful, sharp jaws cut cleanly and quickly eliminating bruised and crushed branches. The pruner operates from your existing hydraulic system whether you own a truck, tractor, aerial lift or hydraulic power unit. For more details, circle (711) on the reply card.



IRRIGATION EQUIPMENT CATALOG: Rain Bird Sprinkler Mfg. Corp., Glendora, Calif.

This fully illustrated product catalog contains a complete and comprehensive description of the entire Rain Bird line of controllers, valves, sprinklers, accessories and hose. An appendix provides a ready source of detailed data on the more complex controllers, along with informative wire sizing and reference charts. For more details, circle (712) on the reply card.

seven subject areas: drip irrigation progress; methods and mechanics; physics and hydraulics; water use; salinity; fertilizing; and crop response.

The Congress program includes A one-day field tour of drip irrigation installations in greenhouses, orchards, vineyards, vegetable fields, and nurseries. The tour will be limited to 250 persons, and preference will be given to out-of-country and out-of-state guests.

The Congress is being co-sponsored by the USDA - ARS and the University of California. Preregistration is $25 for the Congress participants and $10 for their spouses. Deadline for preregistration is June 1. Registration fees after June 1 will be $35 and $10. Preregistration materials and a preliminary program for the Congress can be obtained by writing to International Drip Irrigation Congress, P.O. Box 2326, Riverside, CA, 92506.

Nitrogen Saving Solution

Many sod growers are looking for ways to conserve the use of nitrogen fertilizers they have available. One fertilizer-saving answer is a new nitrogen management product to be marketed by Dow Chemical.

According to the company's researchers, the key is in inhibiting the action of soil bacteria that rapidly convert ammonium nitrogen to nitrate ions. These ions are readily leached from the soil or converted to nitrogen gas and lost to the atmosphere. The rate of nitrification depends on weather conditions, soil type and condition, time of fertilizer application and other factors. Losses greater than 25 to 30 per cent fall-applied nitrogen fertilizer are not uncommon.

With the use of N-SERVE, Dow's new product, the ammonium nitrogen is slowly converted into nitrates and is more readily available for plant growth in a controlled amount over a long period of time. Plant losses can be reduced and yields increased because the nitrogen is available longer in the plant root zone.

Waterhyacinth Clearance Announced by Rhodia

The Environmental Protection Agency recently accepted two products manufactured by Chipman Division of Rhodia, Inc., for control of waterhyacinth. The products are Visko-Rhap Oil-Soluble Amine A-3D and Chipman 2,4-D Amine No. 4.

Visko-Rhap is a controlled drift formulation product for use where susceptible crops are growing nearby or in areas where drift may harm ornamental trees and shrubs. 2,4-D Amine No. 4 can be used in areas such as marshes where drift will not cause problems.

Both products can be applied by air, boat or ground sprayer. However, the company advises that you consult your state game and fish or water control agency prior to application.

Swift Forms Trade Unit

Worldwide shortages of fertilizers, fertilizer raw materials and other basic chemicals have necessitated the formation of international trade units by many U.S. companies. Swiftchem International, one of the newer overseas trade units, was established to place Swift in a position to deal directly with key material sources in other countries.

The new overseas trading organization will be a division of Swift Chemical and will headquarter in Chicago.

Edward R. Vrablik, president of Swift, said that "in the near term, growth of domestic fertilizer industry sales volumes will depend upon expanded imports, particularly nitrogen materials and possibly potash and selected grades of complete fertilizers."

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Tree Trimmer with Fiberglass Handle

Features single-pulley (1¼" cap.) or double-pulley (1½" cap.) tree trimmer head section, and square-end mount pole saw head section with 4 ft., 6 ft. or 8 ft. extension sections with built-in, ALL-FIBERGLASS CONNECTING SLEEVE, and polypropylene rope.

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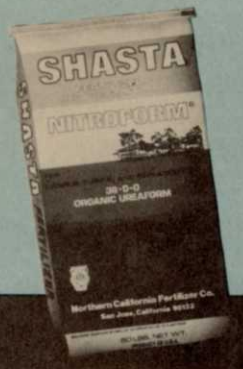

Northern California Fertilizer bags it!

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organic nitrogen

The turf nitrogen for nursery stock, too. Gives the same steady sustained growth.

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Toro, Spartan Fund Study

In an effort to ensure the continuation of research into the mysteries of turfgrass shade adaptation, the Toro Co., of Minneapolis, and Spartan Distributors, Sparta, Mich., presented Prof. James B. Beard, of the Dept. of Soil and Crop Science at Michigan State University, with a $4,000 grant.

Beard hopes to discover how grass adapts to shade or what can be done to breed grass best suited to growing in the shade.

A piece of cake it ain't. But these signs were designed to celebrate the Westchester Tree Protective Association (New York) on its 40th anniversary. From left: H. Palmer Starner, Harrison, N.Y., Jack Flanagan, Elmsford, N.Y., current president and John Crockett, who designed and made the signs.

Experimental Insecticide Controls Japanese Beetle

Fensulfothion, approved for control of nematodes, proved the best of 15 insecticides tested last year at the USDA Station in Wooster, Ohio for control of Japanese beetles resistant to approved insecticides.

There are increasing reports of Japanese beetle populations developing resistance to cyclodiene insecticides like chlordane, dieldrin and heptachlor. Fensulfothion has not been approved for control of Japanese beetles.

Kenneth O. Lawrence, USDA entomologist in the Agricultural Research Service, recently reported on work conducted in cooperation with Harry D. Niemczyk, entomologist at the Ohio Agricultural Research and Development Center in Wooster. Lawrence spoke at the 1974 meeting of the North Central Branch of the Entomological Society of America.

Ten insecticides were applied on the golf course at Wooster on August 24, 1972. Fensulfothion applied at the rate of 10 pounds per acre gave 100 percent control by October 16. Diazinon was next best with 79 percent control.

Stanford Seed Company

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KENTUCKY BLUEGRASS	**FESCUES**
Pennstar	Creeping Red
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Sub-Soil Moisture Tester

AQUAPROBE takes the guesswork out of soil moisture testing. Scientifically measures moisture at depths from 2 to 26 inches. No digging; no fixed point of measurement. Amazingly light-weight, portable and easy to use. Aquaprobe is low in cost, too. Write:

HOWARD S. CRANE, INC.
Oneida, N.Y. 13421

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Fifteen insecticides were tried against resistant grubs at three locations in April and May 1973, when most of the larvae were in the third stage. Fensulfothion at 10 and 6.4 pounds per acre gave excellent control.

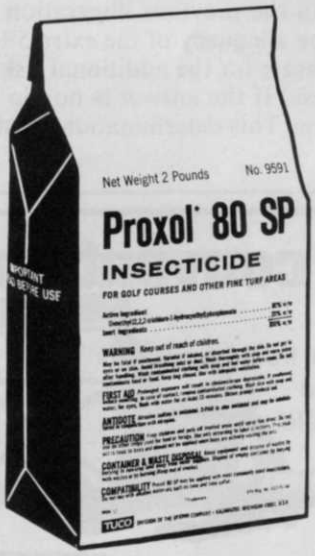
"Aside from three other experimental compounds," Lawrence said, "nothing approached the activity of fensulfothion where the thatch layer was a half inch or more thick.

In other 1973 tests on golf courses, fairways were treated with 1, 2.5, and 5 pounds of fensulfothion per acre. "We consistently obtained excellent and rapid kill," Lawrence said. We showed that spring applications retain efficacy throught the summer and will control the new generation.

After one calendar year the 10-pound rate showed evidence of breaking down and killed only 63 percent of the new generation. Futhermore, granules applied at the 1 and 2.5-pound rates at one golf course remained on the surface for periods of 7, 11, and 15 days during the heat of August before rainfall washed the toxicant into the soil.

It was back to school for the distributorship personnel of Hahn, Inc. A recent series of service schools was conducted to train its representatives in the maintenance and servicing of its turfgrass equipment. Hopefully the trainees will use the expertise gained from this advanced course to instruct individual groups of golf course superintendents and other key maintenance people in the care of Hahn equipment.

Take the guesswork out of turf insect control



Diagnostic Aid from TUCO

Many turf insect larvae are night feeders, so the first evidence of their activity frequently is damaged turf. Diagnostic Aid, applied to turf as directed, causes insects to emerge to the surface within 10 minutes. They can be identified and counted to determine the level of infestation and whether an insecticide should be applied. It also can be used after insecticide application to measure the control obtained.

Proxol* 80 SP Insecticide from TUCO

Proxol is the one insecticide developed especially for use on fine turf and ornamentals. Sod webworms and cutworms are two major groups of turf insects controlled by Proxol. It is estimated that each sod webworm larva can chew up 20 square inches of turf in its average life span of 20 to 40 days; the cutworm larva can devour up to 36 square inches. With 300 to 500 larvae generated from each adult in a period of 10 to 21 days, it becomes apparent why early detection and control are desirable. Using Diagnostic Aid and Proxol together lets you program insect control.

*Trademark

One bottle of Diagnostic Aid FREE in each case of Proxol 80 SP.

BEFORE USING ANY PESTICIDE STOP READ THE LABEL

TUCO Division of The Upjohn Company, Kalamazoo, Michigan 49001

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Essentials of Borrowing

By DR. ERIC LAWSON*

WE ALL BORROW money. Our needs may be different and the risks associated have different limitations. For every so-called rule-of-thumb to borrowing, it is possible to find a firm which has violated the rule and benefited. Yet, it is useful to look at the general rules which have wide use.

For short term temporary purposes, a cash budget is a useful device for determining both the amount and length of need.

One problem faced by many growing firms is the need for temporary financing that grows as the firm grows. In fact, it is possible that what was a temporary need for funds one year will become a permanent need later on. Permanent needs should not be financed from temporary sources. Borrowing should not take place unless there is a need — and no more should be borrowed than is needed.

The need for long term funds should be basically determined on the grounds of profitability of the proposed capital projects. No funds, borrowed or otherwise, should be invested in unprofitable projects. Once the prospective profitability has been determined the remaining decision depends on the alternatives and their relative attractiveness.

The small firm generally has few alternatives since it does not have access to the major capital markets. Even so, cost should be a factor to keep in mind. If the funds are available only on excessively prohibitive terms they should be rejected. The ability of the firm to generate the cash flow necessary to meet the requirements is an important consideration — and must be determined.

Small firm credit funds are most readily available from commercial banks. This is particularly true of short term funds. Banks are in the business of making short term loans and the good banks are aggressively seeking new customers.

The ideal arrangement for both the bank and the customer is one in which the customer knows in advance the maximum amount he may borrow during the year, although he may not wish to borrow the maximum amount for a long time, if at all. Many bankers will say that most of their lending experience involves making an unbankable loan application into an acceptable deal. This process generally involves arranging for some kind of security for the loan.

Commercial banks are also a source for long term funds, almost always secured by a mortgage. Frequently a bank knows of other sources, such as an insurance company, where the funds may be obtained if the terms are right. Other sources of long term funds include special industrial corporations, the Small Business Administration and specialized agricultural institutions.

Term loans are available from some commercial banks. Such loans combine short and long term features. They are usually paid off in annual installments over a period of years. In this manner it is possible to match the cash flow of the firm to the loan repayment provisions.

A firm in the market for borrowing should consider that borrowing as a competitive process. It should be prepared to make full disclosure of all pertinent financial information including operating cash and capital budget for the future. The firm should consider as many lenders as possible and use the forces of competition to keep the ultimate terms as favorable to itself as possible.

The borrowing firms should recognize both the advantages and disadvantages of borrowing. The out-of-pocket costs of borrowing should be at a rate that is profitable to borrow. If a firm can use its capital to earn a 15% return it should be able to borrow at 10%. Obviously, if these figures are reversed borrowing should not take place.

The risk associated with borrowing is a basic question that must be answered. In the previous illustration the real question relates to the adequacy of the extra 5%: Is the 5% enough to compensate for the additional risk incurred by the indebtedness? If the answer is no, do not borrow; if it is yes, borrow. This determination must be made by the borrower.

**The author is chairman of the Department of Finance and Accounting at Syracuse University. This article is based from his presentation at the 1974 Landscape Management Clinic.*

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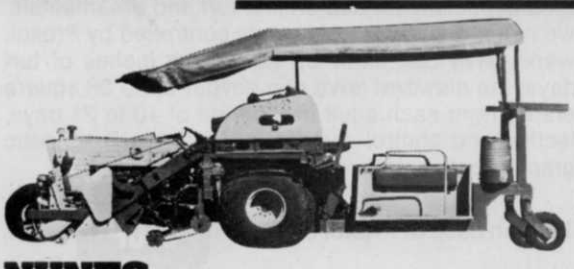

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WT-6

Industrial Roundup Uses Approved by EPA

Monsanto Company's new Roundup herbicide has received Environmental Protection agency registration approval for industrial uses. Roundup is a postemergence, non-selective herbicide which controls a broad spectrum of annual and perennial weeds of both grass and broadleaf species.

The EPA registration permits the use of Roundup for industrial commercial applications, such as the control of weeds along highway, railroad, fuel and power-transmission rights-of-way, airport runway areas and other similar areas with problem weeds.

A company representative said that Roundup effectively controls more than 100 species of annual and perennial weeds, including perennials with well-established root systems such as johnsongrass, quackgrass, dallasgrass, paragrass, Canada thistle, bermudagrass and common mullein.

Further information for the industrial use of Roundup is available by writing to: Agricultural Division, Monsanto Company, 800 N. Lindbergh Blvd., St. Louis 63166.

Chemist Predicts Lasting Fertilizer Shortages

Shortages of one sort or another are plaguing most green industry firms. But diminishing petro chemical supplies are causing across-the-board headaches for large and small firms alike.

A recent issue of **Chemical and Engineering News,** the weekly newsmagazine of the American Chemical Society, reported that the current world fertilizer shortage will continue indefinitely, perhaps for the rest of human history.

Although this shortage is serious, it does not mean the world will have widespread famine, says Dr. Raymond Ewell, recently retired vice president for research at the State University of New York at Buffalo, and widely recognized authority on chemical economics.

"A shortfall doesn't necessarily mean that we won't have enough supplies to feed people at somewhere just above a starvation diet," he explains."But much depends on how our available supplies are divided up."

Ewell cites slowing the world's population growth as the fundamental issue we now face. And he foresees that the rate of world population growth will peak sometime during the 1970's at a little more than two percent a year.

"This will be one of the crucial dates in world history," he states. "For the first time ever, the rate will have begun to decline."

Even so, he adds, the growth rate will decline only very slowly and will probably continue at close to the two percent figure until the year 2000.

Right now, high food prices are serving as a magnet for fertilizer, the article continues. The high demand and rising prices are attracting new investment into the fertilizer industry.

"But the big question," says Ewell, "is whether this will pull in new money fast enough to keep up with demand."

The world will have to spend about $8 billion annually on new fertilizer plants and related facilities now, and about $12 billion by 1980, just to keep pace with increasing demand, he estimates.

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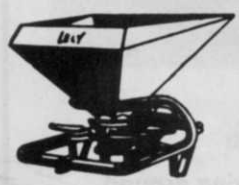

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Even this will not help overcome past shortages, he notes. "In addition, the competition for investment funds from nuclear power, coal conversion, and a number of other industrial projects makes it unlikely that the fertilizer industry will attract all the new capital it needs.

"Another bottleneck," Ewell says, "is the world's relatively small pool of engineers qualified to design and build large-scale fertilizer facilities." Only about 4,000 to 5,000 engineers are properly prepared, he estimates, and these must be spread over other industries as well.

While fertilizer will continue to be in short supply, the actual amount produced will rise, he says. During the next few years, capacities will increase at about seven percent a year, and by the turn of the century the industry will rank second only to petroleum in tonnage of production.

The problem is that demand will rise even faster. And in underdeveloped countries, where population is growing most rapidly, the problem will be magnified.

Ewell calculates that a country must build a new 1,000-ton-a-day ammonia plant (the basis of the fertilizer industry) for every increase of six million people. For a country like India, he explains, this means an additional two and a half plants a year, just to keep pace.

Shigo Receives Award

Dr. Alex Shigo has been given an Award of Achievement by the New York State Arborists Association. His work has received attention among his peers at universities and in governmental agencies, and he is recognized internationally for his contributions to the field of tree research.

New Jersey Sod Industry Triples in Last Decade

New Jersey's sod industry has tripled in size during the last decade, according to Roy M. Atkinson, head of the state's certified sod program.

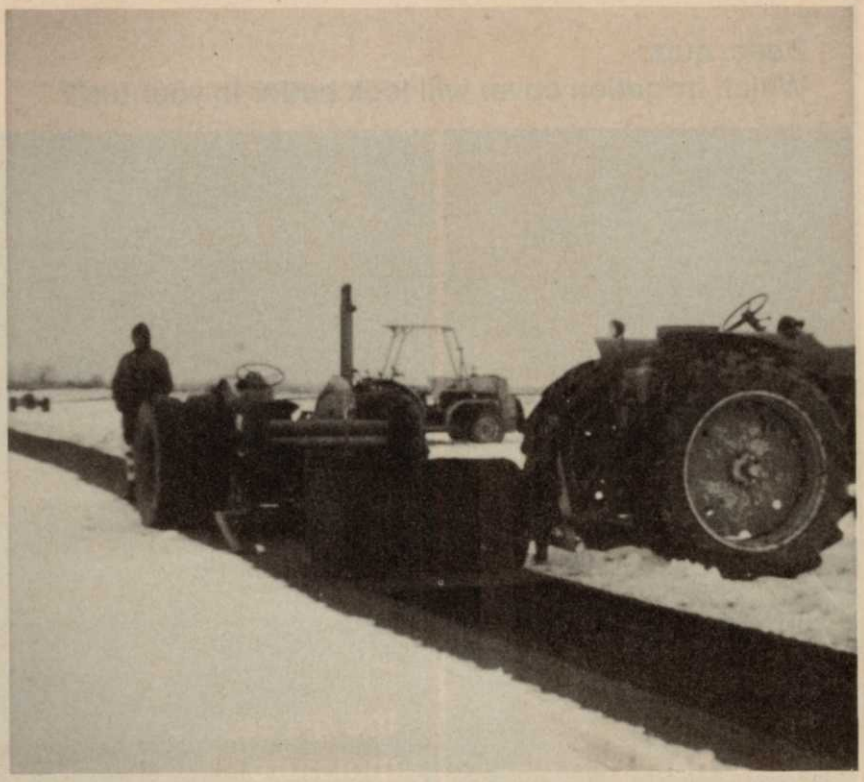
Atkinson has conducted a survey of the sod industry every three years since 1965. The latest shows that New Jersey growers now have a total of 5,837 acres in sod production, compared with 2,997 acres in 1965 and 5,050 acres in 1971.

The 1974 survey shows 33 active sod producers in New Jersey. Seventeen are growing less than 50 acres; two, between 50 and 99 acres; nine, between 100 and 499 acres; four, between 500 and 1,000 acres; and one, more than 1,000 acres. Five growers are producing 58 percent of the total sod sold. Twelve growers have been in business more than 10 years and one producer has been selling sod for 37 years.

Three years ago Atkinson found that 66 percent of the acreage was devoted to growing one variety of Kentucky bluegrass. Today, 66 percent is in blends of more than one variety of bluegrass, 26 percent planted to one variety and 7 percent in mixtures of species.

Asked where they marketed their sod, 26 of the growers said they sold directly to homeowners, 25 to landscapers and 22 to garden centers. Other markets were industry and golf courses.

Almost unanimously, sod producers believe that their industry will expand in the future; only one grower anticipated a decline.



THE BECK SOD-O-MATIC PERFORMS IN SNOW COVERED MICHIGAN

At Beck Manufacturing recently, we received a letter from Bill Schultz of Roseville, Michigan. Mr. Schultz tells us: "The harvester worked well after plowing the snow in November and December. We were cutting in stripped-out peat bogs about eight feet below road level."

For more information on the Beck Sod-O-Matic is a proven system, no matter where or when you sod. For more information, write Box 752, Auburn, Alabama 36830.

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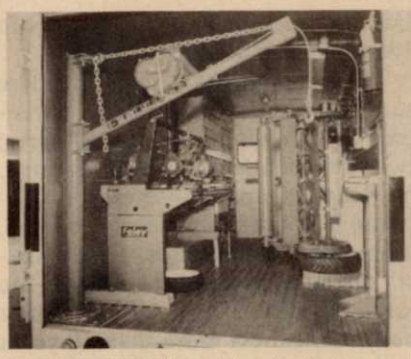

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Mail Order Weed Science

Dr. Harold Alley, University of Wyoming, has published a 13-lesson correspondence course entitled **Weed Science and Technology.** The course emphasizes use and mode of action of herbicides.

Chapters in the bound study book also cover environmental implications of weed control, plus registration and safe application of herbicides. Three examinations, including a final, are mailed during the course. The syllabus contains a weed science glossary, herbicide compendium and index. For more information contact: Correspondence Study Department, University of Wyoming, Laramie, Wy. 82071.

Nematode*(from page 31)*

exist with 25 pounds of DBCP per acre on fairways and 36 pounds on greens.

How about repeat treatments? A superintendent manager who is growing grass for a golf course has to grow good grass. If he is having nematode problems and he fumigates, he is going to grow better grass. Once he starts growing better grass, he can't take a chance of having it go bad, so he treats as needed.

"I think a club can pay for the cost of the injection and material with savings from water, fertilizer and other chemicals need in trying to solve the problem. We can definitely see this in stress periods during hot summer months. You can usually walk to the spot where the fumigation occurred because that is where the grass is greener," Horn explained.

Yancey believes he can save up to 50 per cent in fertilizer. Through January, Yancey said he had not fertilized the Ocala course since early last summer. Normally he has to apply it three times a year in northern Florida, while it was necessary every month in southern Florida.

While this discussion covers primarily Florida, Horn serves widely as a consultant, mainly in the South where the nematode problem is apparently more severe. However, Horn believes nematodes exist in more northern golf courses than is generally realized. Research into the problem in the North has been

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The initial response to the injection will be browning at the sight of application. The turf usually closes in completely in 4 to 8 weeks.

Nematodes*(from page 52)*

limited, primarily because of the belief that lower temperatures and a shorter growing season limit the opportunity of the nematode colony to build up. Perry has conducted some research that indicated significant nematode problems do occur on greens and fairways in the Midwest.

Vigorous turf provides the best weed control anywhere, and a healthy turf is within reach of everyone, Horn concluded. Nematode eradication is part of the insurance package.

Trees*(from page 20)*

such as ammonium sulfate, sulfur, aluminum sulfate or culfuric acid.

Iron sprays will green up the foliage with which it makes contact. However, leaves that develop after the treatment are generally yellow. Sprays containing chelates are generally unsightly and therefore not too desirable. Treatments used to change the pH of the soil are slow with the exception of the sulfuric acid treatment which is rather critical and must be applied with caution. The best results have been obtained by the use of soil treatments, particularly with the use of iron chelates. However, these remedies have not been without their disappointments. Presently, the suggested treatment is the use of iron chelates or iron sequestrians adapted for use on alkaline soils. These products should be applied in early spring before or just after growth starts and at concentrations recommended by the manufacturers.

The use of iron-containing capsules inserted into the trunk of chlorotic trees has also shown promise. A number of holes are bored into the trunk of the chlorotic tree, with the aid of a high speed drill. The holes should be deep enough so that

(continued on page 56)

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People on the move

GAIL C. OLSEN, named director of customer service for the pipe and plastics group of Certain-teed Products Corp. Olsen will be responsible for all customer service and billing functions within the group.

* * *

CLEMENS C. OTTEN, joins Ciba-Geigy's agricultural division as a market planning specialist. In other company moves **VERNON WILBUR SEIM** named field research representative in the northeast region. He will be responsible for research and development programs in Ohio and Kentucky. **BOBBY JOE (BOB) CONNER,** promoted to research specialist. His new position will involve researching plant growth regulators and micronutrients.

* * *

JOHN C. KRUG, appointed general service manager for Jacobsen Manufacturing Co. He replaces **ROY PAUR,** who retired after 47 years with the Racine firm.

* * *

GERALD C. OGREN, promoted to factory manager for Ryan Equipment Co. **EDWARD E. SQUIRE,** named material control manager. **KEITH H. RHODES,** hired as engineering manager for the turf care products division. Rhodes was previously employed with J.I. Case.

* * *

ROBERT W. BENNETT and **SHERMAN K. REED,** elected vice presidents of FMC Corp. Bennett will remain manager of the agricultural chemical division and Reed will continue as chemical group technology director.

* * *

EUGENE E. TAYLOR, promoted to director of the marketing agricultural business group of Velsicol Chemical Corp. His responsibilities include advertising, promotion, merchandising, market planning and market research.

* * *

BILL W. LINGREN, joins ICI America Inc., as a technical sales representative in the marketing department of its' agricultural chemicals division.

* * *

NEAL D. CRANE, elected vice president of Allegheny Ludlum Industries, Inc. He will be responsible for the consumer products group and chairman of the board of Jacobsen Manufacturing Co. **FRED W. SCHNEIDER,** elected president of Jacobsen. Schneider has been president of the Lockwood Corp. since 1968.

* * *

P. C. DUSSOL, appointed divisional director of materials for the outdoor power equipment division of the Toro Company. Dussol will coordinate production and inventory controls.

* * *

CECIL E. BAYLOR, assumes the new position of manager of the agricultural staff of the Vistron Corp. **JACK W. BROWN,** promoted to manager of agricultural services. **TOM P. CHRISTEN,** named manager of employee relations and advertising for the company's agricultural chemicals division. **HAROLD W. PAULSON,** named manager of sales operations at the Lima, Ohio, headquarters.

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Trees(*from page 54*)

the capsules when inserted will be situated in the sapwood with the head of the capsules flush with the cambium. This will allow the iron citrate to be dissolved in the sap and translocated to the leaves. Capsules inserted during the early stages of growth have produced positive results in 10 days or less.

Information for the correction of manganese deficiency is not as readily available since Mn deficiency of ornamental trees is not too common. But the use of manganese sprays has been effective in "greening up" the foliage. However, the use of manganese chelates injected into the soil in the spring should produce more lasting results.

Trees in well maintained turf areas are probably not starving to death. But in areas where turf is being irrigated with water that has a high pH, it is possible that certain species of trees may be lacking in iron or manganese. These deficiencies can be corrected by the use of Fe or Mn chelates or by inserting iron-containing capsules into the trunks of trees.

BONDS(*from page 16*)

In order to satisfy itself that you can perform a surety must inquire into and satisfy itself as to your:

1. **Background and history**
2. **Your organization**
3. **Your equipment or the availability of equipment**
4. **Your business acumen**
5. **The adequacy of your professional, i.e. legal, accounting, etc., advice**
6. **Your cost records and internal accounting system**

Similarly, in reviewing your ability to pay your bills the surety must satisfy itself as to:

1. **Your credit history or how you have paid your bills in the past**
2. **Your available bank credit**
3. **Your corporate or personal finances**

Since your ability to perform, once questioned, is rarely tested on a regular basis the emphasis in the long run rests on your continuing ability to pay your bills and finance new work. The more financial data you furnish a good surety the more confidence you will engender.

For instance, your fiscal financial reports are going to carry more weight than your interim financial reports. There are a lot of reasons for this but it all boils down to the fact that if you have really made a profit you will have to pay a tax on it. If you are paying taxes you are making money. Now, there are four methods of recognizing income, namely;

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Completed Contract

You can be on one method for taxes and another for credit. This is fine. But at the end of your fiscal year the surety can review your reported and unreported profits, determine what tax might be due on your unreported profit and arrive at an honest net worth or working capital for your company. The figure which they arrive at should not be what determines the amount of surety credit you receive but it will help them to determine your ability to pay your bills and finance new work.

Scheduling in a financial statement is almost a prerequisite since

(*continued on next page*)

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MISCELLANEOUS

TREE APPRAISALS, Surveys, loss evaluations and expert consultation services. For names of members of the American Society of Consulting Arborists, Inc., throughout the country, contact: Executive Director ASCA, 12 Lakeview Ave., Milltown, New Jersey 08850.

BONDS*(from page 56)*

the supporting schedules tell what goes into the make up of the balance sheet items. And, if we had to pick out one schedule in particular as being most important we would pick a schedule of work in process which tells what profits have been earned on jobs, what the status of the job is and what profits are yet to be earned.

The final item a surety must consider in evaluating a surety case is the job itself. What is the job? Is it in line with what you normally do? Can you finance it? How much of the work will be done by subcontractors? How much of the work is straight material purchase? How are you to be paid? How does the scheduling of the work fit in with your other work?

Some general do's and don'ts in dealing with sureties and in the conduct of your business:

1. **Use good professional outside help and let your outside advisors help each other for your benefit.**
2. **Value your surety just as you would your bank.**
3. **Communicate with your surety. Keep them informed and if you do not like what they tell you ask questions. Both of you will probably learn something.**
4. **Cooperate with your surety.**
5. **Dedicate yourself to generating profits and to the growth of your company. Don't bleed the company. Let it grow.**

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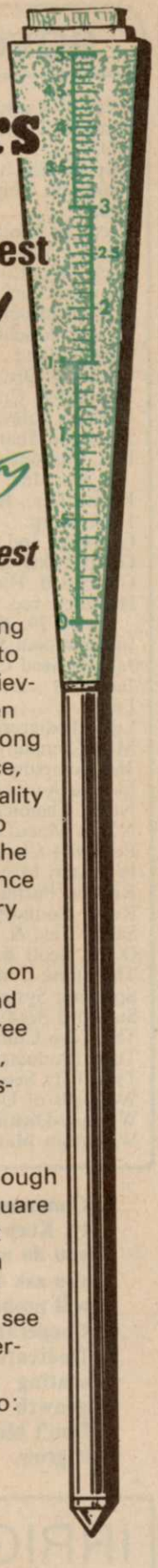

NEW

Galaxy
KENTUCKY BLUEGRASS

Against Your Best

Seeing is believing and we want you to see Galaxy's unbelievably beautiful green winter color, its strong spring performance, its superior turf quality and density and so much more, that the only way to convince you is to let you try it yourself.

Just write to us on your letterhead and we'll rush you a free sample for testing, packed in a professional quality rain gauge.

You'll receive enough Galaxy for a 50-square foot test plot. Not enough to make a million bucks, but enough to let you see how Galaxy outperforms your best bluegrass. Send to:

WHITNEY-DICKINSON SEEDS, INC.
52 Leslie St., Buffalo, NY 14211

For More Details Circle (135) on Reply Card

trimmings

LOVE CONQUERS ALL. A young Georgia couple stood before the Justice of the Peace and repeated vows and exchanged rings which bound them in matrimony. The scene was witnessed by a well-wishing throng of 100-150 persons. The setting was the No. 9 green of the Northwood Golf and Country Club in Lawrenceville, Ga.

Unusual, this wedding on a golf green? Not really. And yet, unusual because of all the participants.

The Justice of the Peace walked onto the green and stationed himself at the flagstick. A procession of five, blue and white streamer bedecked golf cars drove up from the south end of the clubhouse, headed north in front of the Pro Shop and dining room turned west down the car path to the level of the green, circled it, and one by one the cars deposited their passengers to join the Justice of the Peace. First, the groom stepped out, then in order, the flower girl and ring bearer, the mother of the bride and the mother and father of the groom. Then to the strains of "We've Only Just Begun" sung by a soloist, the father led the radiant bride down the steps to the green and placed her hand into that of the groom. Each promised to love and honor the other and the Justice pronounced them man and wife.

Unique, you say? Yes, because each of the participants is intimately connected with golf at Northwood Club. The bride is the daughter of the master mechanic on the maintenance staff. The groom is assistant golf course superintendent. The Justice of the Peace is Northwood's course superintendent and the groom's boss'. The soloist is the daughter of Northwood's club manager.

DID YOU KNOW that the average 18-hole golf course can provide the oxygen required by a town of 7,000 people? Philip A. Wogan, chairman of the Environmental Impact Committee of the American Society of Golf Course Architects, pointed out that golf courses have also been used to recreate areas of beauty where former scars once existed — sanitary landfills, strip mines and gravel pits. "In many densely-populated areas, the golf course also serves to moderate the effects of noise pollution." The Society is finding that many environmental changes aren't harmful to an area, but merely change its character.

GESUNDHEIT! EPA scientists are studing fish "coughs", a naturally-occurring phenomena which has stirred the interest of the agency's water quality specialists. The coughing, which is actually a normal gill-clearing process to remove debris which has settled on the gills, is a natural action for many fish, including all species of trout and salmon. "The ultimate use of our findings," said an EPA biologist, "could be a system for keeping tabs on concentrations of complex industrial wastes entering lakes and streams from waste treatment plants and industry. A sudden increase in fish coughs within a given body of water could trigger an alarm to warn plant personnel that potentially damaging effluent is leaving the plant." I wonder how you say help in fish?

HOW BIG is the turfgrass business in Virginia? According to a 1973 report on a turfgrass survey conducted by the Virginia cooperative crop reporting service, turfgrass in Virginia is a $524 million industry. This includes $68 million spent for maintenance; over 58 million hours of unpaid family labor for the year valued at $94 million; new area establishment costing over $27 million and a replacement value for equipment of $333 million. Included in the replacement value for equipment is over $63 million for new equipment purchased. Commissioner S. Mason Carbuagh of the Virginia Department of Agriculture and Commerce notes that the total value of turfgrass cannot be measured in monetary terms, since it encompasses an intangible aesthetic value for property and human welfare.

PEANUT BUTTER EATERS are becoming bigger consumers. Consumption of peanut butter and peanut butter sandwiches has topped 600 million pounds, according to the Georgia Peanut Commission who keeps tabs on these things. The demand for peanut products is at an all time high. Not since the end of WW II has the consumption rate increased so fast.

"The course looks great this summer."

"And he seems to be spraying less often than before."

This summer, give your members two things they will really appreciate. A green, healthy playing surface and far less interference from spraying equipment.

You can, if you take the second step in the Du Pont TERSAN® 1-2-3 Disease Control Program and start spraying TERSAN 1991 on your tees, fairways and greens now. It does an outstanding job of controlling Dollar Spot and Large Brown Patch. Used as directed, it can actually stop these summer turf diseases before they have a chance to damage your turf.

On greens and tees you reduce spraying time sharply, because you apply TERSAN 1991 only every 10 to 14 days. This Du Pont fungicide combines preventive and curative (eradicant) properties for better, longer-lasting disease control.

With this second step in the TERSAN 1-2-3 Program, along with the first and third steps taken in the spring and fall, you control all major turf diseases on all turf grasses all season long. (Should conditions for Pythium occur, at any time, an application of TERSAN SP will prevent or eradicate it.)

The TERSAN 1-2-3 Program is effective, economical and complete. For details and a supply of TERSAN turf fungicides, contact your golf course supplier today.

With any chemical, follow labeling instructions and warnings carefully.

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TERSAN 1·2·3 DISEASE CONTROL PROGRAM

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*U.S. Plant Patent #3186, Dwarf Variety

KENTUCKY BLUEGRASS

Baron comes up fast, then settles down to form a strong, dense root system that is an ideal grass for golf courses, fine lawns, sod fields, industrial and commercial locations. Once Baron comes up, the slow growth means less frequent mowing. And Baron is ideally suited to low mowing too. . .even down to ¾ inch. The sturdy, broad blades interlock to make a compact, thickset surface. In a cold area? Baron is extremely winter-hardy. . .it keeps its deep-green color well into the cold months. Baron keeps that deep-green color longer because it responds well to late season fertilization and is highly disease-resistant, especially to leafspot, rust or stripe smut.

All Baron seed is CERTIFIED BLUE TAG, *Poa annua* and bentgrass-free.

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Jamestown
RED FESCUE (A Chewings Type)

Jamestown's deep-green color and low-growing qualities make it the most asked for red fescue in the northern United States on home lawns, parks and golf courses. When a blend is needed, Jamestown improves the texture and the appearance of Kentucky bluegrass in sun or moderate shade with minimum care. And, during mild winters Jamestown may carry its lush color through the entire season. Try a blend of Jamestown/Baron today.

Certified
Exeter
COLONIAL BENTGRASS

A highly disease, drought, and mold resistant variety ideal for fairways alone or in combinations with other grasses. Exeter forms a dense, low-growing, non-colonizing, turf that is often associated with other bentgrasses.

Certified
Kingstown
VELVET BENTGRASS

The only velvet bentgrass – for the ultimate in fine texture and dark-green color on putting greens. Kingstown thrives on acid soil and requires less fertilization to achieve outstanding results.

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